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AUTOMOTIVE INDUSTRIES

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Car Order Backlog Getting Bigger

Quality Control in a Tractor Plant

The Barge That Walks and How It Does It

Possibilities of the Gas Turbine for Automobiles

What's New in Racing Car Design

Studebaker's Expanded Truck Line for 1949

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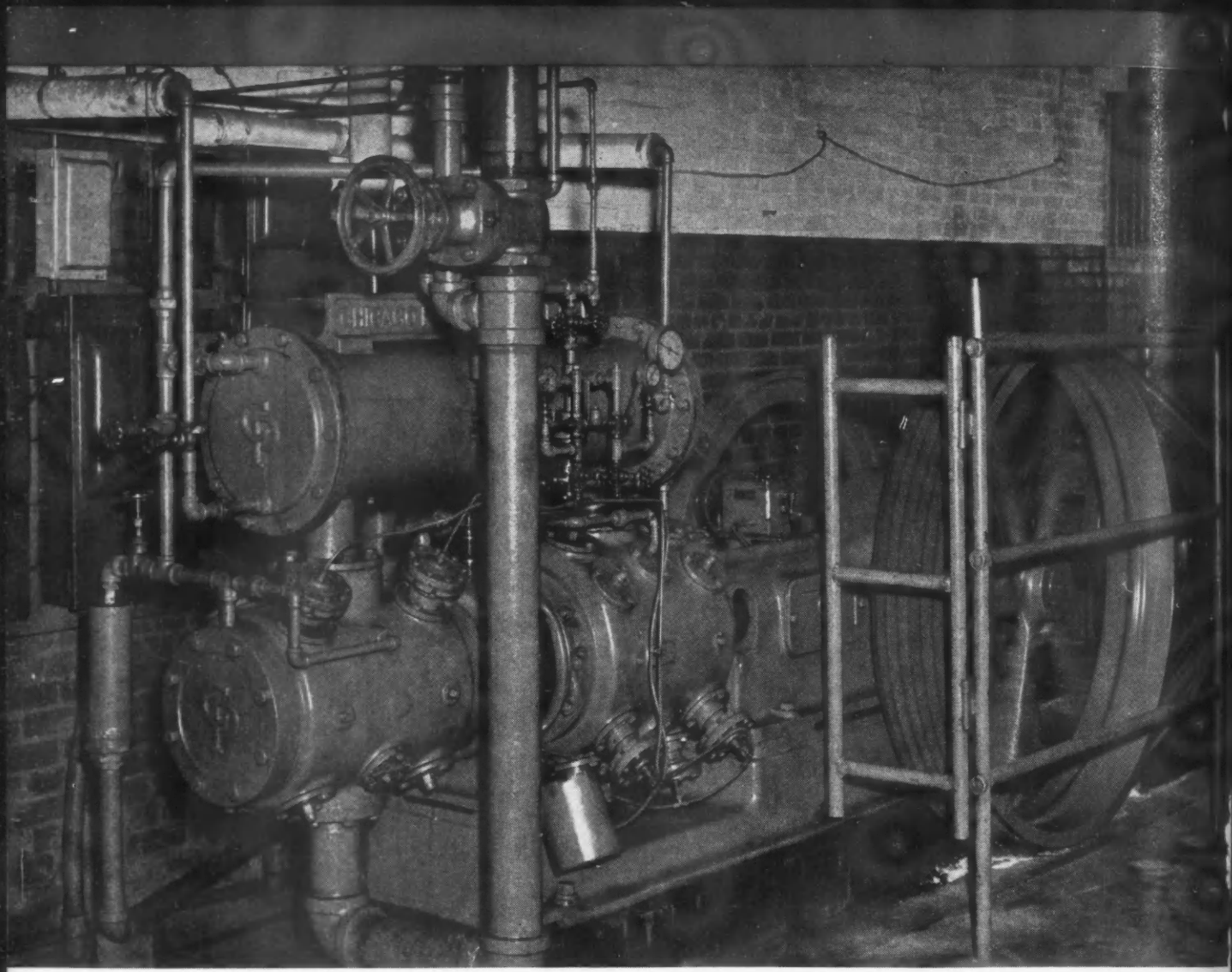

...and after that, no cleaning in 11 years!

A midwest pump manufacturer was having carbon-deposit trouble with the valves of the compressor shown above. Frequent cleaning was compulsory. Maintenance cost was high, compressor efficiency low.

"Make a test with Stanoil. Its high stability should lick your problem," said a Standard Oil Lubrication Engineer. The test was made . . . it has grown into 11 years of service (24 hours a day during the war) . . . and *no cleaning has been required in all that time!*

Clean operation with Stanoil results from its high stability plus an exceptionally effective oxidation inhibitor. Stanoil is a multi-purpose oil, that can replace many special and costly oils in your plant.

At the right are listed the principal types of equipment where Stanoil can save you money and maintenance time. A Standard Oil Lubrication Engineer will be glad to help you make a test. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

For improved lubrication of . . .

- **Compressors and Ice Machines**
- **Power Transmissions**
- **Hydraulic Turbines**
- **Gas Engines**
- **Steam Engines**
- **Steam Turbines**

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Industrial Oil

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REDUCTION UNITS, TOO

Available in a broad range of ratios . . . COTTA reduction units are found in many industrial applications . . . cranes, shovels, rock crushers, generators, pumps, and the like. Particularly suited for adjusting high-speed Diesel output to the r.p.m. of slower-speed units. Input torque ranges from 150 foot pounds to 1350 foot pounds. COTTA precision-engineering throughout.

THIS INFORMATION WILL HELP YOU

Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

An Assurance of Dependable Service

COTTA
HEAVY-DUTY TRANSMISSIONS

"Engineered-to-order"

How INTERNATIONAL HARVESTER Provides

EXTRA STRENGTH WHERE IT COUNTS

The Los Angeles-Seattle Motor Express, Inc., operating 150 truck and trailer units that move 16 million pounds of freight and travel 400,000 miles per month, uses the truck-trailer combination shown here.

The first International "Western" model delivered made 15 round trips between Seattle and Los Angeles in 10 weeks, averaging 3600 miles per week for a total of 36,000 miles.

THIS type of heavy-duty truck-trailer unit is establishing notable records in west coast operations . . .

And in large measure, the remarkable performance of these International Harvester Company, Chicago 1, Ill. "Western" models stems from the combined strength, toughness and durability of *vital parts* specified in nickel alloy steels.

For instance, the Timken-Detroit rear axle units assure peak load carrying capacity, as well as resistance to wear and shock loads, by utilizing case-hardened gears of Type 4320 and 8620 nickel-chromium-molybdenum and 4815 nickel-molybdenum steels. Likewise, high torsional strength in rear axle drive shafts is secured with Type 4340 nickel-chromium-molybdenum steel.

Harvester also specifies transmissions with gears of 4615 and 4815 nickel-molybdenum steels. The engines, built by Hall-Scott or Cummins, utilize nickel alloys for scores of vital parts, including nickel alloy cast iron for cylinder liners. Steering arms and other vital front end parts are largely of 3140 and 8620 steels.

Not only dependable performance, but ready response to fabrication are secured from appropriate nickel alloy steels. Write for data.

Several of these heavy-duty 6-wheel trucks with special bulk cement-hauling trailers are used by International Cementers, Inc., of Long Beach, California, to serve the wide Los Angeles oil basin area.

Designed for a minimum capacity of 37,600 lbs. of cement, the special bulk tank is 30' long, 8' wide and about 10'6" high. Two screw conveyors in the special "W" bottom of the tank unload it when driven by an auxiliary engine mounted at the forward end of the trailer.

EMBLEM OF INCO SERVICE
TRADE MARK

Over the years, International Nickel has accumulated a fund of useful information on the properties, treatment, fabrication and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes, nickel silver, cupro-nickel and other alloys containing nickel. This information is yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC.

67 WALL STREET
NEW YORK 5, N.Y.

AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

June 1, 1948 Vol. 98, No. 10

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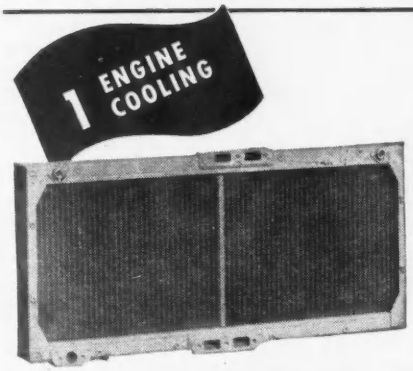
BUS BUILDERS USE

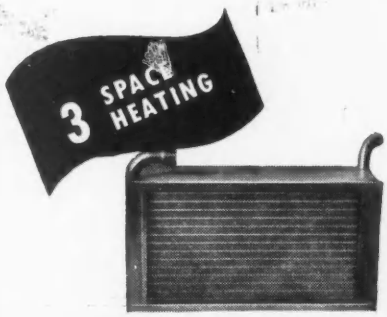
YOUNG FOR ALL

THREE COOLING REQUIREMENTS



● Rugged radiators engineered to maintain engine jacket water at proper operating temperatures.

● Young-designed coolers for torque converter fluid are made in two types: Tube bundle (illustrated), or tube and fin radiator.



● Tube and fin hot water heater cores provide a flood of healthful heat yet occupy a minimum of space.

● When you require heating, cooling or air conditioning equipment, call on Young for complete Engineering Service. Serving the Automotive Industry for more than two decades, the Young organization has developed many new designs and applications in the heat transfer field. Write for full details today.

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PRODUCTION DOUBLED CUTTER COST HALVED

Actual results achieved through the use of Texaco Sultex Cutting Oil

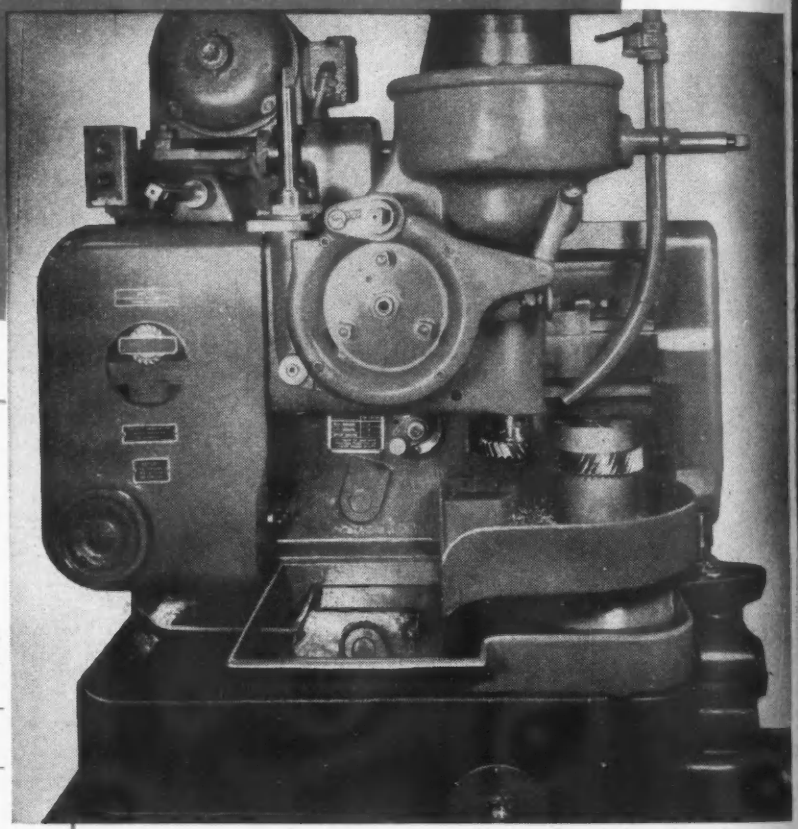

Photo courtesy Fellows Gear Shaper Co.

THE JOB:
Cutting automotive transmission gears, 8-10 pitch, 14 and 19 teeth.

THE MACHINES:
Two high-speed Fellows Gear Shapers.

THE RESULT:

	No. Gears cut per tool grind	Cutter stock removed in regrinding	No. gears cut before scrapping cutter
Competitive Cutting Oil	26	0.018"	504
Texaco Sultex Cutting Oil	32	0.011"	1017

Permissible stock removal 0.350" before scrapping cutter.

To improve cutting performance and machine tool output and to reduce costs on jobs like the one illustrated, and many others, use *Texaco Sultex Cutting Oil.*

Texaco Sultex Cutting Oils are carefully compounded, active oils that permit increased speeds, feeds and depth of cut, yet assure improved surface finish and longer tool life.

These benefits pay off in higher output per machine and lower unit costs of production.

Sultex is only one of a complete line of *Texaco Cutting, Soluble and Grinding Oils* designed to do all your machining jobs better, faster, at lower cost.

A Texaco Lubrication Engineer specializing in cutting operations will gladly help you select and use the right cutting fluids to give you best results on all your work. Just call the nearest of the more than 2500 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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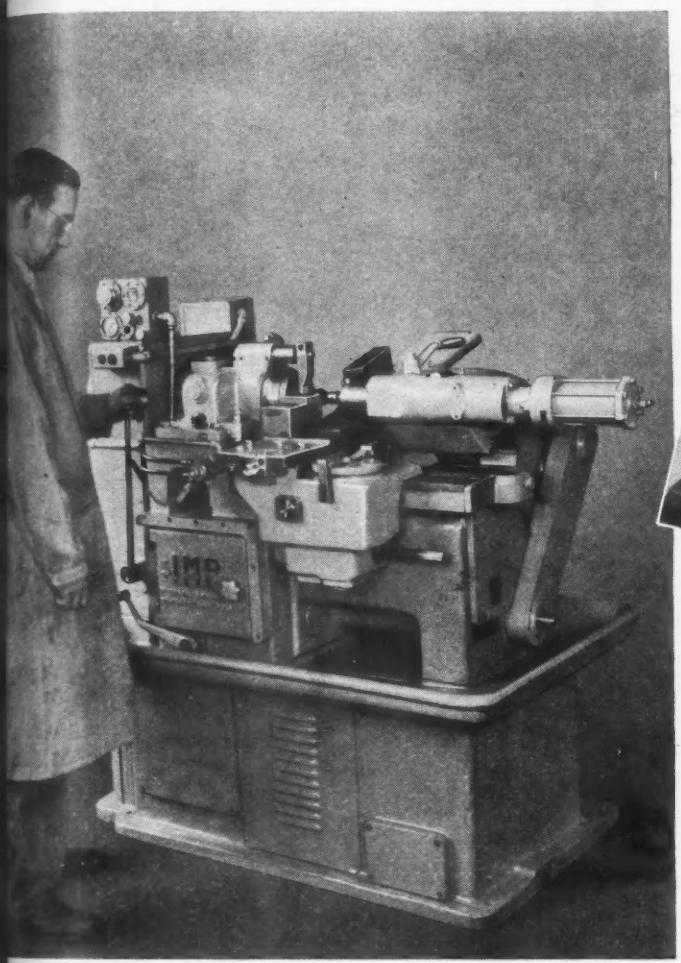
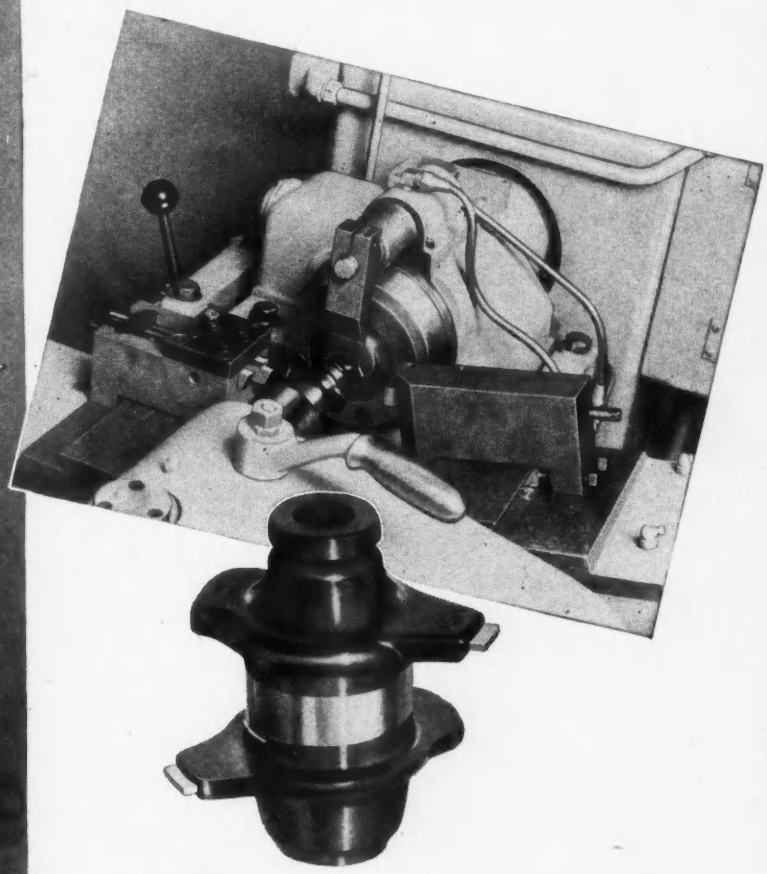
PARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK





Lo-swing IMP

TURNS AND GROOVES DISTRIBUTOR ROTORS WITH SPEED AND ACCURACY

Problem: To turn contact ring, distributor points and locking ring groove on Distributor Rotors. All machined surfaces must be concentric with the taper bore and have a fine, smooth finish.

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The Distributor Rotor is mounted on a special arbor which is accurately fitted to the headstock spindle bore, and prevented from working loose by a suitable locking bolt. The small end of the arbor is supported by a revolving tailstock center carrying a hardened and ground bushing which maintains a constant pressure on the end of the work piece, preventing any end play.

The contact ring and the distributor points are turned with three cemented carbide tools mounted on the front slide, while the ring groove is formed with a similar type tool mounted on the rear slide. The turning tools are properly spaced so that the intermittent cutting on the distributor points will not mark the contact ring. At the completion of the machine cycle, the operator throws an air valve, relieving the tailstock center and also actuating the work stripper arm located just over the headstock spindle.

The machine cycle is extremely fast and the operator's work is reduced to the strict minimum of loading the parts on the arbor and pushing the starting lever.

Consult our Engineering Department for full information regarding time and other saving equipment.

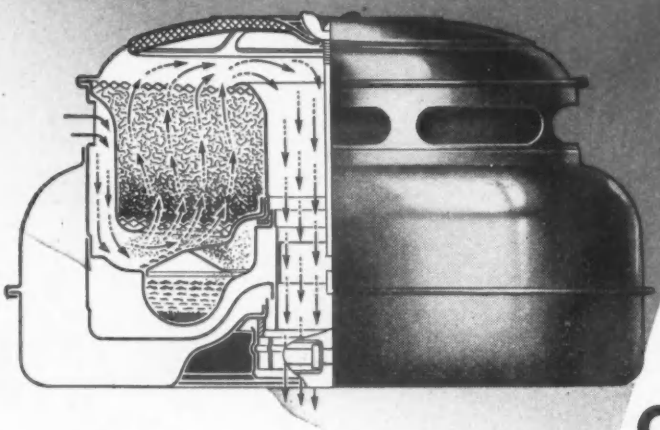
SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

RODUCTION COSTS ARE LOWER WITH Lo-swing

Now!

FOR FIRST TIME

AIR CLEANER AND SILENCER STANDARD ON COMPLETE LINE OF NEW TRUCKS



Pictured is the type of United Combination Oil Bath Air Cleaner and Silencer standard on the new Studebaker truck. This unit not only cleans dirt-laden air before it enters the carburetor, but also greatly lessens under-the-hood intake manifold noises.

NEW STUDEBAKER STANDARDIZES ON UNITED COMBINATION

Equipped with United Combination Oil Bath Air Cleaner and Silencer, the new half-ton is one model of the full line of Studebaker trucks using this combination as *standard equipment.* Drivers of these new trucks can now enjoy an engine quietness comparable to passenger cars, with under-the-hood noises greatly reduced.

For over 25 years United has built air cleaners for trucks, automobiles, tractors, stationary and portable power units. More than 260 different air cleaner models provide protection for every type of internal combustion engine. We invite discussion of your design and installation problems.

UNITED SPECIALTIES COMPANY

UNITED AIR CLEANER DIVISION, CHICAGO 28
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POWER

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Exide Batteries are built specifically for the difficult job of cranking Diesel engines . . . with extra ruggedness to keep them on the job day after day.

Exide Diesel Cranking Batteries are giving a good account of themselves on trucks, buses, off-the-highway equipment, ships, railroad locomotives, in power plants and other Diesel applications. Whatever the cranking job, you can always rely on Exide Batteries for dependability, long life, economy and ease of maintenance.

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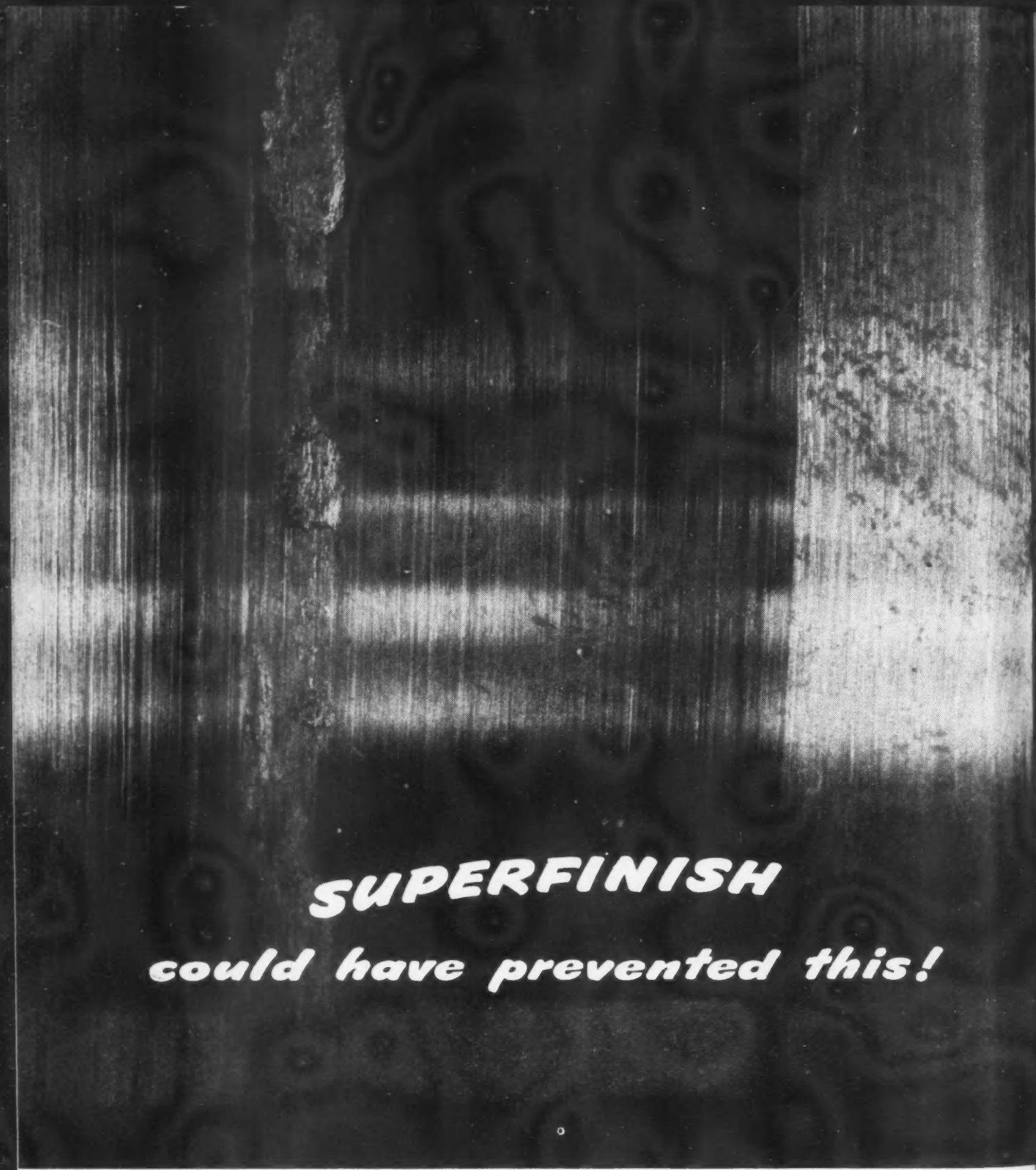

Enlargement shows a scored and galled surface of a 3½" O.D. bearing that "froze" and failed. Had this surface first been Superfinished, it would have had nearly twice the load-bearing capacity and about three times the life. "Wear and Surface Finish," is a new textbook on Superfinish. Write for it on your company letterhead.

GISHOLT MACHINE COMPANY
Madison 3 • Wisconsin

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

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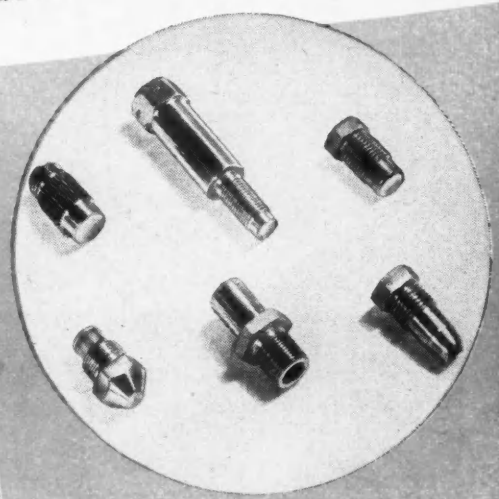
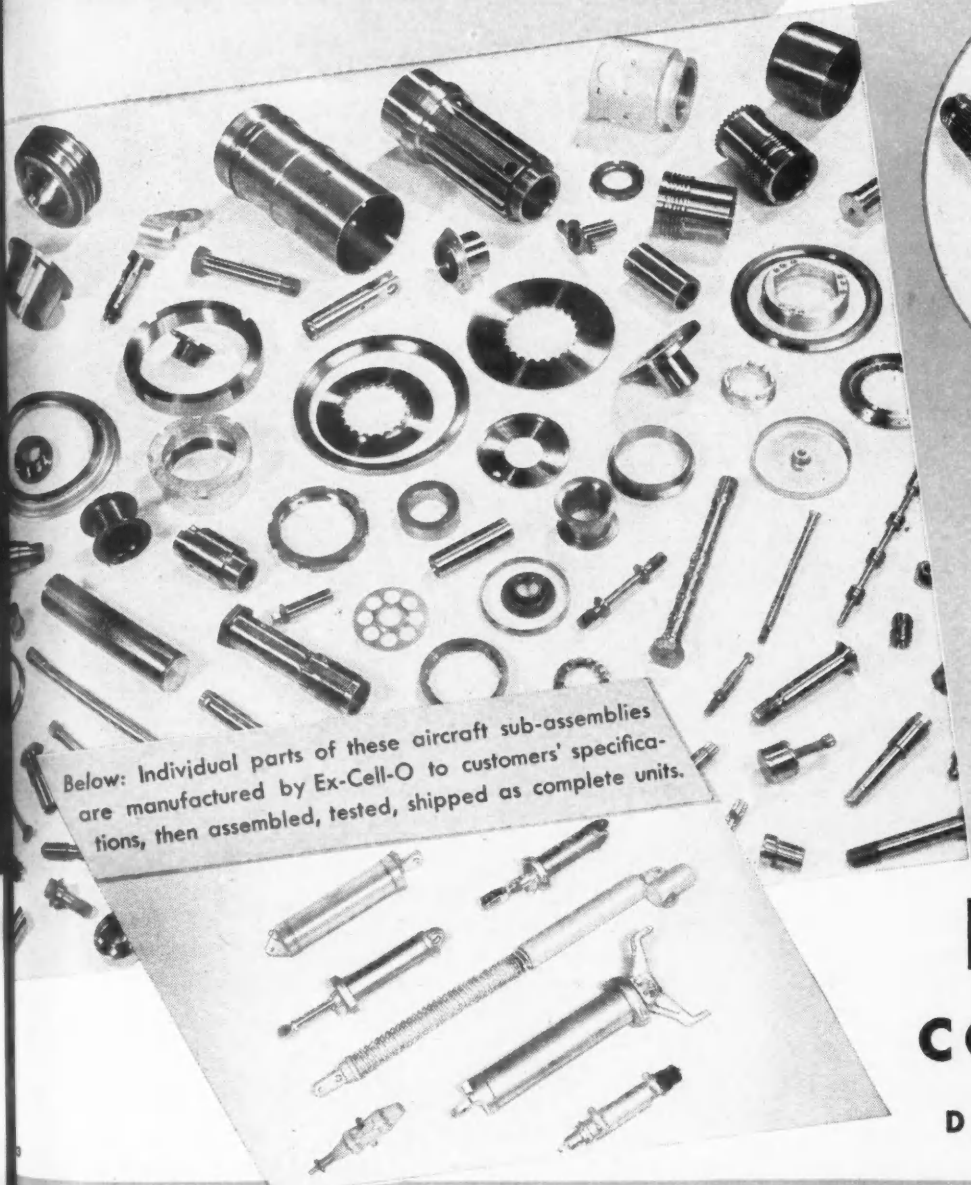
Ex-Cell-O is a pioneer in bringing accuracy and high production to the manufacture of metal parts and assemblies for aircraft engine builders and other aviation industries . . . Three huge Ex-Cell-O plants in Detroit have the mos modern and complete facilities for rough and finish machinin of precision parts from bar stock, forgings and casting for heat treating all types of work in large or modera quantities, for assembling parts with highly skilled super sion and inspection . . . all under one experienced, respo sible management. Ex-Cell-O works exactly to the custom specifications and ships the parts in whatever volume is requi . . . Send Ex-Cell-O a sketch, sample part, or a blueprint quotation, or get in touch directly with the Head Offic Ex-Cello Corporation, 1200 Oakman Blvd., Detroit 32,



Above: Aircraft gasoline injection nozzles such as those illustrated above are manufactured and assembled by Ex-Cell-O.

To left: Group of typical precision aircraf parts manufactured by Ex-Cell-O to cu tomers' specifications and in any volum



Below: Individual parts of these aircraft sub-assemblies are manufactured by Ex-Cell-O to customers' specifications, then assembled, tested, shipped as complete units.

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for *increased* production between sharpenings

use

BARBER-COLMAN CARBIDE TIPPED HOBS

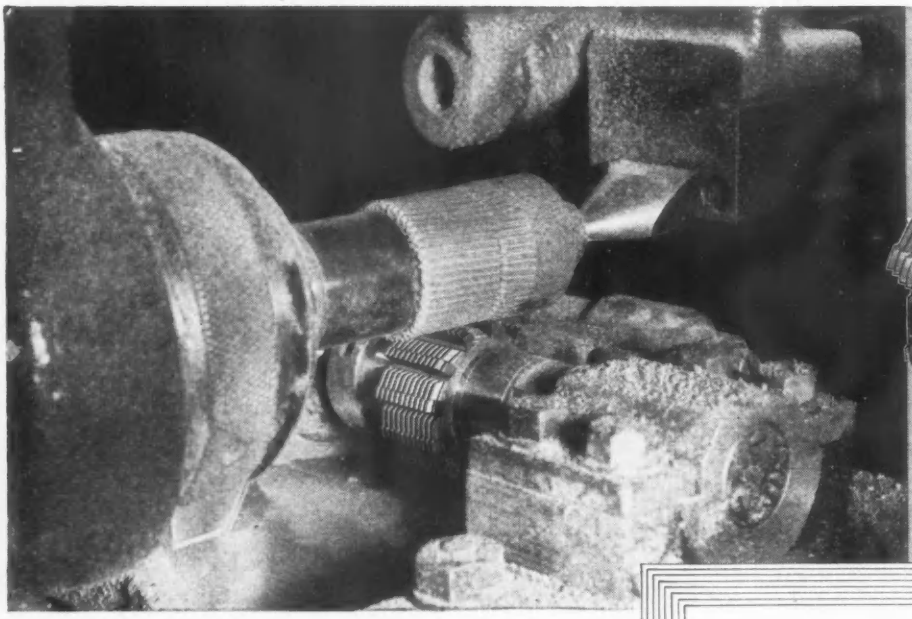
Increased production between sharpenings makes tool cost proportionately lower per piece. On highly abrasive materials which dull high speed steel tools quickly, a major improvement in wear resistance and accuracy can be obtained with carbide tipped tools.

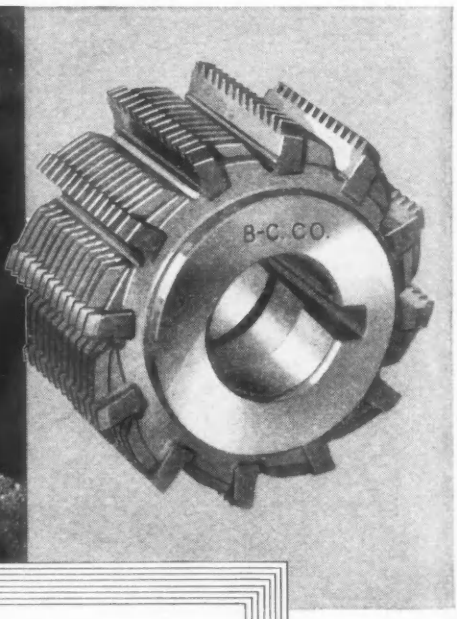
Since 1938 Barber-Colman Hob Engineers have been making Carbide Tipped Hobs for a variety of production, as well as experimental jobs. This experience has shown them that Carbide Tipped hobs, from 4 to 120 diametral pitch, are unusually successful for hobbing laminated phenolic plastics, fiber, molded asbestos, and some non-ferrous metals such as aluminum. Almost unbelievable tool life has resulted, and the gears produced are of better quality because wear on hob teeth is negligible while cutting one arbor-load.

Results so far in hobbing steel and cast iron gears have not been sufficiently conclusive to recommend use of carbide hobs. However, Barber-Colman Hob Engineers will gladly supply recommendations concerning feeds, speeds, clearances and grades of carbide for cutting non-metallic gears. Ask them to demonstrate how Carbide-Tipped Hobs quickly pay for themselves in increased production and tool life.

Barber-Colman Company

GENERAL OFFICES AND PLANT 107 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.





JOB FACTS

Operation — Climb Hob Lead Screw Gears, 36 Pitch, 53 Teeth, 2 per load.

Material — Insuroc

Hob — Barber-Colman Carbide Tipped Hob, 1¼ x 1¼" x taper bore.

	Former HSS Hob	Carbide Hob
Feed—	.020"/rev.	.040"/rev.
Speed—	309 RPM	533 RPM
Floor-to-Floor—	21 min.	6.5 min.
Hob Life—	7500 total	60,000 total

MODERN MACHINES DEMAND *Modern* CUTTING TOOLS

BARBER COLMAN

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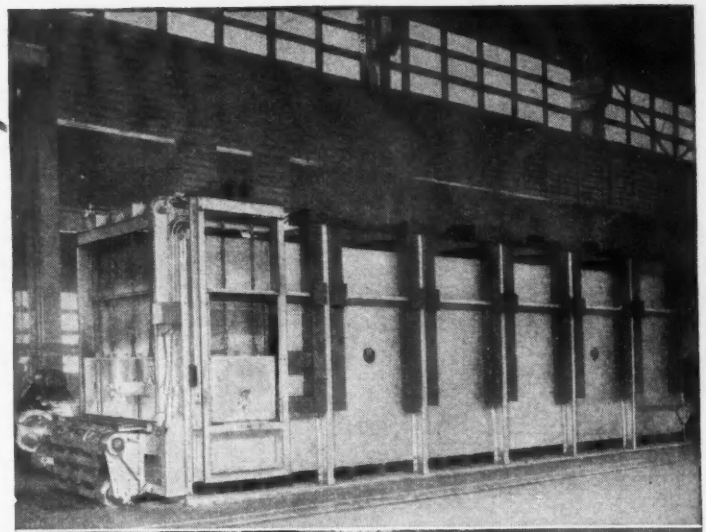

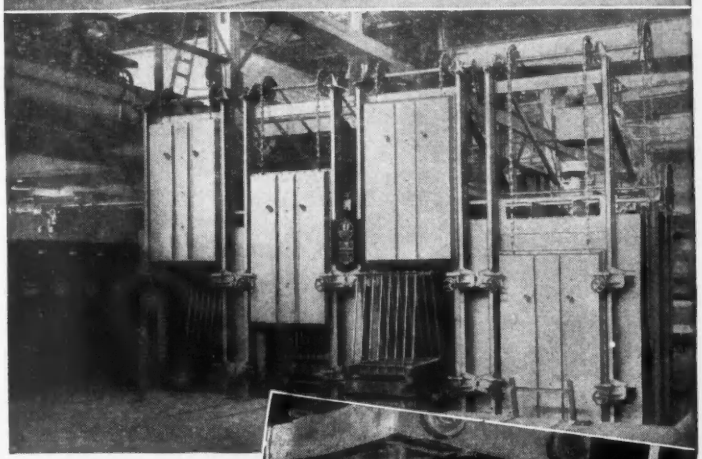

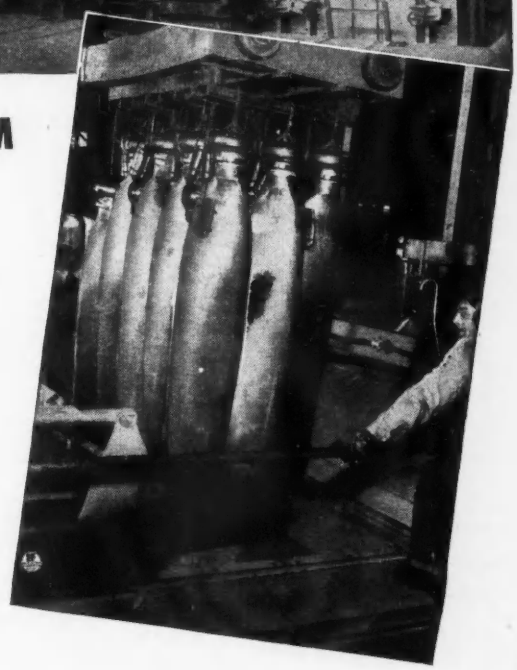

Select an

EF ALUMINUM OR MAGNESIUM HEAT TREATING FURNACE

● The uppermost picture shows an EF continuous chain slat conveyor type furnace for heating aluminum billets for forging. The center view shows an EF 400 KW four chamber car type batch furnace for homogenizing magnesium cakes. The lower view shows an EF 600 KW continuous recirculating pit type furnace in which propeller blades suspended from a car are heated and quenched.

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WILSON ST. AT PENNA. R.R.

GAS FIRED, OIL FIRED AND ELECTRIC FURNACES
FOR ANY PROCESS, PRODUCT OR PRODUCTION

Salem-Ohio

For BETTER PARTS to meet needs like these:

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- Isolating vibration
- Cushioning shock
- Electrical insulation
- Weight reduction
- Temperature control
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- Air and liquid filters
- Gaskets, channels, etc.
- Grinding, polishing, etc.
- Instrument mounts

Design with WESTERN Felt

Improved performance and greater functional dependability are achieved by many types of cut parts—processed from Western Felt. It's an extremely versatile material that offers unusual characteristics—including resiliency, flexibility and compressibility—plus high resistance to water, oil, age and heat. Western Felt, engineered to specific needs, cuts easily to any form . . . and does not ravel, fray or lose its shape. *New applications are found daily.*

Why not check Western Felt's superior qualities and possible uses? Write, wire or phone today!

Acadia Synthetic Division, Processors of Synthetic Rubber and Plastics; Sheets, Extrusions, and Molded Parts.

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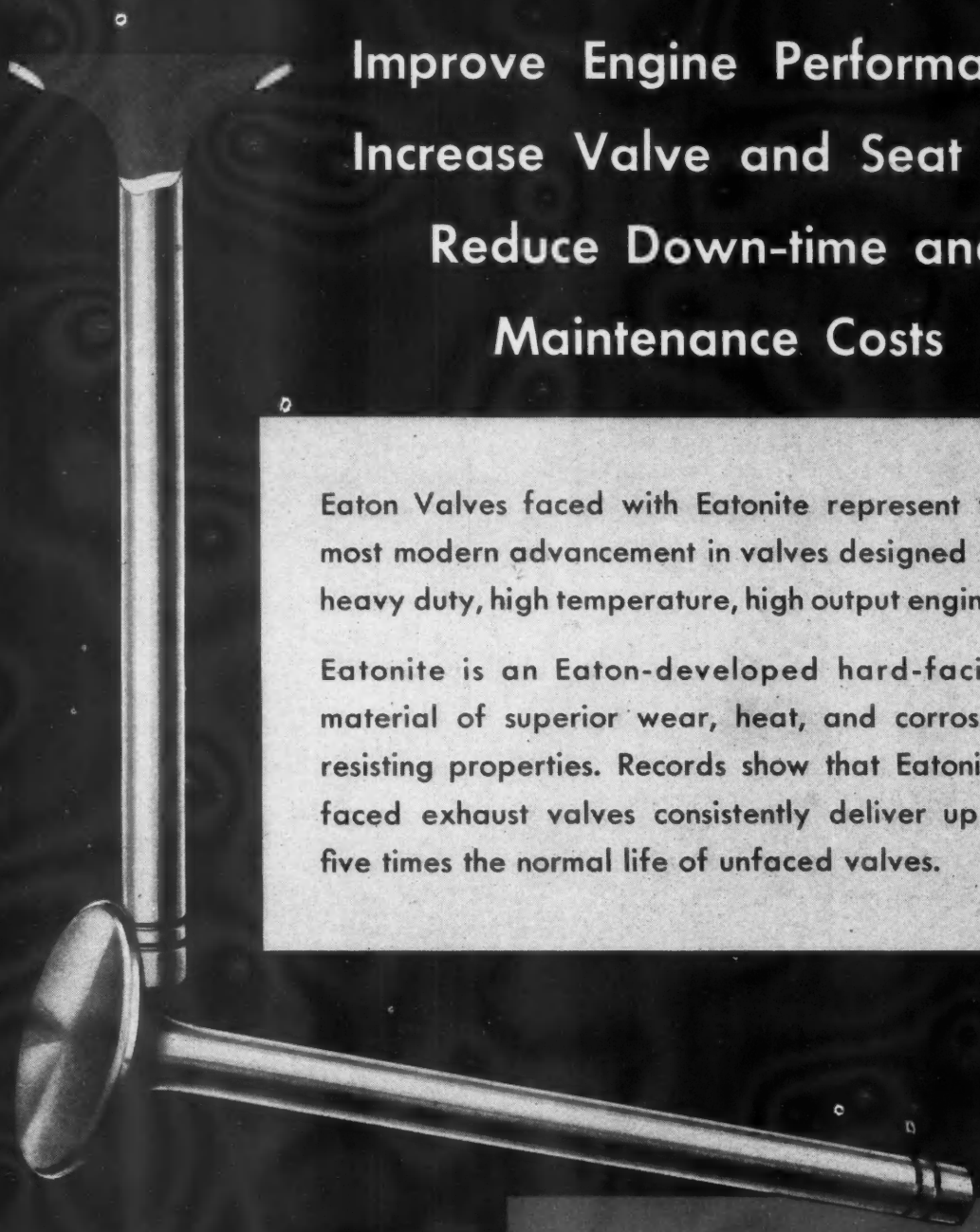
Improve Engine Performance, Increase Valve and Seat Life, Reduce Down-time and Maintenance Costs



Eaton Valves faced with Eatonite represent the most modern advancement in valves designed for heavy duty, high temperature, high output engines.

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World's Most Widely Proved Power Brake!

It's logical reasoning that the Power Brake that is *preferred* is the one for your truck. Hydrovac has shown performance proof over billions of miles. Wise manufacturers install it—fleet operators prefer it! Hydrovac gives truck control regardless of load conditions; it's engineered—by Bendix—for safety, long life, and reliable performance. Install the world's most widely proved power brake on *your* vehicles, and you know your trucks have the best! *REG. U. S. PAT. OFF.

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AUTOMOTIVE INDUSTRIES
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High Spots of This Issue

Unfilled Car Orders Greater Than Year Ago

On top of an already mountainous stack of older orders has come an upsurge of buying in recent weeks which puts the total backlog at history's highest level. The reader will have a better viewpoint on the size of the problem confronting passenger car manufacturers by turning to page 25.

The Walking Barge

In its uncanny ability at amphibious performance this new 120-ton vehicle is said to remind the onlooker of an immense sort of turtle or frog. Just how an all-welded barge developed by the Navy can traverse ocean, swamp, mud-flat, sand, snow, ice, hard ground, climb slopes, and mount abrupt vertical walls will be found on page 26.

Gas Turbines For Automobiles

Stressed in this article is the necessity for double turbine arrangement for practical propulsion application in passenger cars. Many advantages are shown for this system over piston-type engines. This interesting discussion starts on page 30.

Quality Control in a Tractor Plant

Although statistical control is taken for granted as applied to manufactured lots measured by the thousands, here is revealed a simple workable system of quality control as applied to relatively small lots counted in terms of hundreds of units. The technique being used experimentally and beneficially as applied to every aspect of foundry operation begins on page 34.

Simplified Gasoline Injection

In this article the author proposes a manifold-pressure type of automatic mixture control on a conventional fuel injection pump to simplify the setup for a gasoline engine. He discusses various phases of this problem beginning on page 42.

29 New Product Items And Other High Spots, Such As:

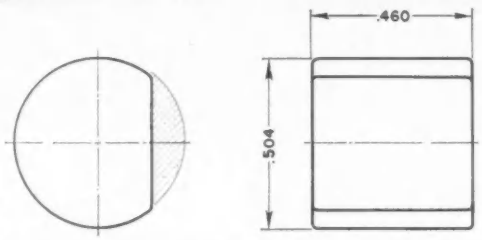
Studebaker's expanded truck line for 1949; what the British are doing with the gas turbine in the automobile field; a survey by the Automotive and Aviation Parts Mfrs. showing a 38.5 per cent increase in "hidden payroll" costs; 1948 innovations in American racing car design; a new self-contained line for making stabilizer bars; and tooling requirements of French automobile and tractor plants.

News of the Automotive Industries, page 17
For Complete Table of Contents, See page 3

Two lanes of one-way traffic step up production on this Hydro-Broach

to 2000 per hour

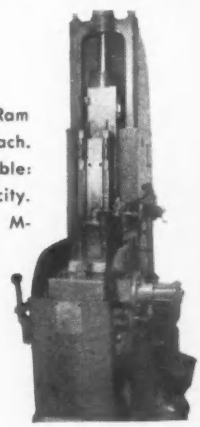
This drawing shows how easy it is for the operator to broach 2000 parts per hour.



Drawing of part broached on the equipment illustrated above. (Broached surface shown in color)
Part name . . Plug. Material . . Brass. Operation . . Broach Flat.
Production . . . 2080 per hour, approx.
Machine . . . CINCINNATI No. 1-30 Single Ram Vertical Hydro-Broach.

It's easy to see why production moves faster in one-way traffic, but it's not so easy to apply this principle at the point of action in machine tools. Cincinnati Application Engineers did it quite successfully in the equipment shown here, *attaining a production of over 2000 broached parts per hour.* ¶The machine is a CINCINNATI No. 1-30 Single Ram Vertical Hydro-Broach, tooled up with an automatic hydraulic fixture which automatically positions and clamps four parts (two under each broach insert) and then ejects them after the broaching stroke. The operator merely keeps the two magazines full. ¶You may not have a big volume of production like this example, but if the parts manufactured in your shop can be broached, they can be broached better, faster and at lower cost on a CINCINNATI, tooled up by Cincinnati Application Engineers. These men are at your service.

CINCINNATI Single Ram Vertical Hydro-Broach. Seven sizes available: one- to ten-ton capacity. Write for catalog M-1389-2.



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NEWS of the AUTOMOTIVE INDUSTRIES

Vol. 98, No. 10 June 1, 1948

First '49 Ford Showing in New York, June 10

First public showing of the 1949 Ford will be held in New York City from June 10 to 15, according to J. R. Davis, Ford vice president. The cars will go on display at dealers showrooms on June 18. In addition to the completely new suspension system, the cars will offer an improved V-8 and a new six-cyl engine, which the company says gives up to 10 per cent more in gasoline mileage and as much as 25 per cent with overdrive, which will be offered as factory installed optional equipment.

Chrysler Strike May Hit New Models

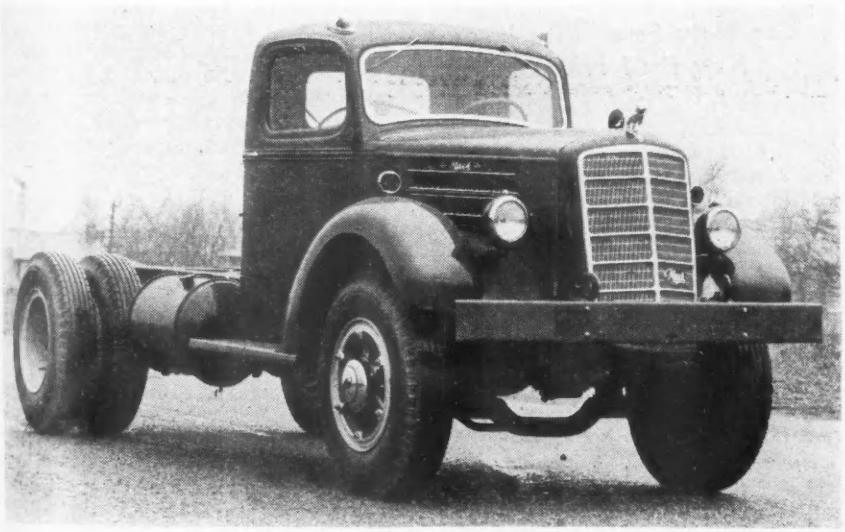
What effect the Chrysler strike will have on the timing of the company's new models is not now apparent. Chrysler originally had planned to change models in about November or December, and it is possible that suppliers would accept cuts in commitments this far ahead, even if the strike should last 60 days or more. By the end of this year, every other company will have introduced its postwar styling, barring unforeseen difficulties. GM is expected to bring out its newly styled A body for the Chevrolet, Pontiac, and smaller Oldsmobile in October or November. Nash will also make a change about that time with completely new styling in the lower, wider trend. In addition, the larger of the two lines, the Ambassador, will go to the unit-frame construction that now features the 600 line.

Bradley Made Chairman of Highway Users Group

Albert Bradley, executive vice president and director of GM, has been named chairman of the National Highways Users Conference. He succeeds Alfred P. Sloan, Jr., GM board chairman.

Hudson Drops Distributors for Direct Dealers

Hudson Motor Car Co. has announced that it is discontinuing most of its distributorships effective Aug. 1. Hudson is the fifth major car company to go from the distributor system to direct dealers since the end of the war. Nine zone offices and large parts warehouses will be opened in addition to 11 zone offices and warehouses already in operation. The 20 units will serve approximately 94 per cent of the United States with car parts and accessories. The remainder of the United States distribution will be handled by independent distributors.



MACK'S NEW MODEL

This new 45,000 lb gross-combination-weight Mack truck-tractor has been designated Model EQT. It is powered by a 431-cu in. Thermodyne engine which develops 139 hp at its governed speed of 2500 rpm. The Mono-Shift transmission is offered on this model.

Crosley is First Car Maker to Adopt Bonded Brakes

Crosley Motors, Inc. is the first U. S. passenger car company to adopt bonded brake linings as standard equipment on its car. Dodge has been using the linings on its lighter trucks, but Crosley is the first passenger car to use them. The company also announced that the bonded lining brake system can be installed on all postwar Crosley cars. A four-wheel set will cost about $4.

Truck Output Far Ahead of Same Period Year Ago

Although production forecasts for 1948 have indicated that fewer trucks will be built than in 1947, production during the first four months of this year was 40,000 ahead of the same period in 1947. However, the distribution of light models in relation to the number of heavy units built will be different this year with the light models constituting a much larger percentage of the production. The heavy duty market has softened considerably since last year, and even the medium priced field is not as lush as it was last fall. Sales managers report that demand for medium trucks is very spotty with some sections practically in a seller's market, whereas others are still far behind orders.

Hayes Makes Body Parts for Ford and Studebaker

Hayes Mfg. Corp. of Grand Rapids, Mich. has taken on the production of body part assemblies for Ford and Studebaker. The company will make various body stampings for the Lincoln, and hoods and fenders for Studebaker cars. The new work was acquired to replace contracts with Willys-Overland for production and assembly of Jeep station wagon bodies. The Willys contract expired May 20. Both Ford and Studebaker will supply Hayes with incidental sheet steel requirements.

NEWS *of the* AUTOMOTIVE INDUSTRIES

NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the Two Months' 1948 Total.

Make	Feb. 1948	Jan. 1948	Feb. 1947	Two Months Units 1948	Two Months Units 1947	Two Months Per Cent of Total 1948	Two Months Per Cent of Total 1947
Chevrolet	49,729	51,960	36,245	101,689	76,629	20.61	19.45
Ford	39,982	42,499	36,202	82,481	69,580	16.71	17.66
Plymouth	20,303	28,616	21,309	48,919	38,954	9.91	9.89
Buick	18,744	17,042	15,889	35,786	30,667	7.25	7.78
Dodge	13,604	19,075	12,596	32,679	25,105	6.62	6.37
Pontiac	17,110	15,346	13,956	32,456	25,716	6.57	6.53
Oldsmobile	11,832	11,383	12,312	23,215	25,195	4.70	6.39
Studebaker	9,359	9,373	6,415	18,732	13,145	3.79	3.34
Mercury	8,942	9,633	7,695	18,575	14,613	3.76	3.71
Nash	7,887	8,114	6,653	16,001	14,554	3.24	3.69
Chrysler	5,855	8,036	5,785	13,891	11,738	2.81	2.98
Kaiser	6,319	7,063	2,531	13,382	4,798	2.71	1.22
Hudson	6,497	6,271	6,802	12,768	12,951	2.59	3.29
DeSoto	4,296	6,367	4,228	10,663	8,607	2.16	2.18
Frazer	4,441	5,178	1,320	9,619	2,446	1.95	.62
Packard	3,326	3,892	2,804	7,218	5,487	1.46	1.39
Cadillac	1,697	4,047	3,174	5,744	6,458	1.16	1.64
Willys-Overland	1,766	1,792	1,336	3,558	2,582	.72	.66
Lincoln	1,161	1,607	1,555	2,768	2,994	.56	.76
Crosley	1,331	1,375	897	2,706	1,676	.55	.43
Austin	424	234	....	658	....	.13	...
Playboy	2	....	....	2	....	...	...
All Others	73	69	46	142	117	.04	.02
Total	234,680	258,972	199,750	493,652	394,012	100.00	100.00

*—Data from R. L. Polk & Co. and are for all states with the exception of California.

GM Reveals New Process Development Section

Culminating a long period of preparation, GM's newly created Process Development Section, headed by Harold Johnson, is rapidly completing its organization plans and is expected to be in full operation before the end of this year. Its facilities are being expanded on the top floor of one of the factory buildings of the Cadillac Motor Car Div., and includes about 100,000 sq ft of floor space. According to Mr. Johnson it will provide special research facilities not available within the corporation at the present time. For one thing, it will undertake the study of processing new products at the point where GM Research would normally stop, that is before the new item is assigned to a specific GM division. A comprehensive layout of machine shops, heat treating, sheet metal, and laboratory facilities will make it possible to study such special problems as may be presented by manufacturing divisions.

Another aspect of the operation will be the study of new processes and techniques originating in GM Research or in the manufacturing divisions or presented by the suppliers of production equipment. In such cases new machine tools or process equipment can be set up in a specific section and operated under actual production conditions. Samples of parts and products made by all GM divisions have been mounted in a special display room to permit study by committees from the various plants.

Hudson Nets $1,451,000 In First Quarter

Hudson Motor Car Co.'s net income for the first three months of this year was down slightly from the same period a year ago. For the three months ending March 31 of this year, net profit was $1,451,000, compared with $1,791,000 for the corresponding period of 1947.

See Only Small Rise in New Ford Prices

It is reported that prices on the new Ford car, scheduled for introduction this month, will be somewhat higher than on the previous model, but will not increase nearly as much as did the Mercury prices which went up more than $400 on some models. The best guess now is that the percentage increase on the 1949 Ford will be possibly only six or seven per cent. The much greater production volume on the Ford line will permit a lower tooling cost charge for each car than is possible on the Mercury.

To Sell 1000 Renaults In United States

Plans have been completed for marketing 1000 rear-engined Renault automobiles in the United States, according to Jean Guillemon, director of commercial exportation. John L. Green Operations Inc., New York City, has been formed to handle this business. The Renault, which is expected to be in production at the rate of 100 cars a day by June, rising to 300 a day next year, is powered by a four cyl, valve-in-head engine developing 19 hp at 4000 rpm. The car will sell for approximately $1195. The Renault plant, which was nationalized after the liberalization of France, has been retooled during the past two years.

Military Needs Not Likely to Hit '48 Truck Output

It does not appear that military orders will cut into commercial truck production to any extent this year despite rumors that truck builders have been receiving military orders. Not a single such order has been placed in the industry for anything other than experimental developments, so far as can be determined. Timken, the major supplier of axles and other truck components, has received no production orders and if any expansion of military demands were in prospect Timken would be one of the very first companies to get advance orders on components. The company has extensive forge facilities which would be needed in a defense program. Timken is currently doing experimental and development work for the military services, as are other companies in the truck field.

Jet Airliner Now Being Built in Canada

Production of the prototype of a jet airliner, powered by four Rolls Royce Mark V jet engines and designed for a cruising speed of 400 mph, is well under way at the plant of A. V. Roe, Canada, Ltd. in Malton, Canada. It is scheduled to fly next March. A new long range jet fighter, details of which are still secret, is also being built by Roe.

British Ford Prices Announced

Ford has announced prices on the British-made passenger car and light van trucks that Ford dealers will market in the United States. The Anglia, two-door sedan, will deliver in New York for $1398, and the Prefect, four-door, for $1568. The Thames, one-quarter-ton van, is priced at $1192, and the one-half-ton model at $1594. The vehicles will be sold through more than 125 Ford dealers in the New York, Washington, Philadelphia, Boston, and Wilmington area. Dealers handling the cars will offer complete parts, maintenance, and repair services.

NEWS *of the* AUTOMOTIVE INDUSTRIES

Ford Changeover Time Less Than Expected

Ford Motor Co. reports that it made excellent progress during the changeover to the 1949 Ford, and that total layoffs were far under the estimates made early in March. At that time it was expected that between 20,000 and 25,000 employes would be laid off from two to six weeks, but actually the highest layoff at any one time was only 11,200. By the first week in May, all but 1600 employes were back at work. The cost of the retooling alone for the changeover for all the company's new models was nearly $90 million.

Ford is said to have under development a light chassis that will be offered this fall to package delivery users who can mount their own bodies. Details are not yet available, but it is said to be a chassis type with forward controls.

Chrysler Strike Slated for Long Stalemate

From all indications the Chrysler strike is setting out to be a long and bitter one. The walkout came after negotiations collapsed with the union and the company 11 cents an hour apart. In an effort to avert a strike, Chrysler reinstated its offer of six cents an hour, once previously withdrawn, and the union lowered its sights to 17 cents an hour. On this point of difference, the parley snagged, and the workers marched out. A significant point is that the 17 cent compromise offered by the union was a straight hourly increase across the board, indicating abandonment, for the time being at least, of the other economic demands such as pension plans, health and welfare funds, and guaranteed weekly wages. From all reports, the strike was not a popular one among the rank and file worker.

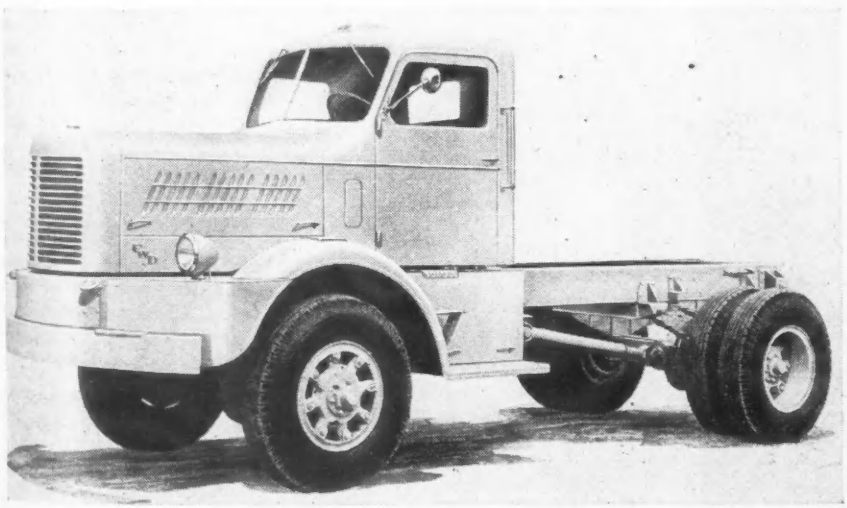
The effect of the strike on automobile production will be the loss of about 24,000 cars and trucks a week. Prior to the strike, it was reported that Chrysler was near a shutdown because of low steel supplies. Currently, the company is accumulating materials and probably will be able to make up some of its lost production, but the longer the stoppage lasts the more difficult it will be to recover lost ground. Supplier plants have also been affected, principally Briggs, which supplies bodies. About 75,000 Chrysler workers are affected by the strike, and it is estimated that ultimately that many more in supplier plants may be out of work.

NEW TRUCK REGISTRATIONS*

Arranged by Makes in Descending Order According to the Two Month's 1948 Totals.

Make	Feb. 1948	Jan. 1948	Feb. 1947	Two Months Units 1948	Two Months Units 1947	Two Months Per Cent of Total 1948	Two Months Per Cent of Total 1947
Chevrolet	20,051	21,876	16,015	41,927	32,991	30.92	27.69
Ford	13,791	7,124	14,311	20,915	27,755	15.42	23.29
International	9,559	9,875	6,835	19,434	13,817	14.33	11.59
Dodge	8,615	6,784	8,753	15,399	17,566	11.36	14.74
G.M.C.	4,413	5,136	3,400	9,549	6,780	7.04	5.69
Studebaker	3,728	3,703	2,937	7,431	5,053	5.48	4.24
Willys Jeep	3,453	3,762	2,304	7,215	4,675	5.32	3.92
Willys Truck	1,222	1,133	....	2,355	....	1.74	...
Reo	893	1,112	994	2,005	2,043	1.48	1.71
White	944	987	870	1,931	1,813	1.42	1.52
Mack	789	1,044	653	1,833	1,170	1.35	.98
Diamond T	760	780	691	1,540	1,407	1.14	1.18
Divco	426	516	289	942	611	.69	.51
Federal	391	399	356	790	717	.58	.60
Brockway	251	360	315	611	780	.45	.65
Autocar	229	284	370	513	786	.38	.66
Crosley	88	151	...	316	...	.23	..
F.W.D.	165	106	109	194	204	.14	.17
Ward La France	45	45	55	90	118	.07	.10
Hudson	21	32	282	53	443	.04	.37
Oshkosh	16	36	28	52	53	.04	.04
Sterling	26	24	25	50	61	.04	.05
Kenworth	13	17	..	30	..	.02	..
Nash	..	2	..	2	..	..	..
All Others	185	247	161	432	351	.32	.30
Total	70,074	65,535	59,753	135,609	119,194	100.00	100.00

* Data from R. L. Polk & Co., and are complete for all states with the exception of California.



FWD ADDS ANOTHER

Rated at 33,000 lb GVW, the new FWD model ZU, recently announced by the Four Wheel Drive Auto Co., Clintonville, Wis., is the first in the FWD line to feature the new FWD all-steel cab. Recommended for year around highway maintenance, oil field and lumber hauling, the ZU is powered by a high compression gasoline engine developing 188 hp.

Ford Counters Union Demand With Wage Cut Proposal

In answer to UAW-CIO demands for wage increases and other benefits totaling 50 cents an hour, Ford Motor Co. has asked the union to accept what would be actually a wage cut. John S. Bugas, Ford vice president and director of industrial relations, proposed that wage differentials between Ford and its competitors be eliminated; wage rates in all branch operations be established at community or area wage levels; a sound basic plan for extending the incentive system wherever practical be adopted; present pay relative to Saturday and/or Sunday operations be liberalized; and payment to union representatives by the company for time spent on union business be eliminated.

NEWS *of the* AUTOMOTIVE INDUSTRIES

Chrysler First Quarter Net Is $14.9 Million

Equivalent to 4.4 per cent of sales, 1948 first quarter earnings of the Chrysler Corp. totaled $14,921,644, as contrasted with $21,502,408 earned in the first quarter of last year. Net sales in the first three months of 1948 amounted to $336,519,790 as against $317,041,078 in the same period in 1947. K. T. Keller, president, in announcing first quarter operations emphasized that the chronic shortage of basic materials, and a local shortage of fuel gas further impaired actual output as against capacity to produce. Unit sales of Plymouth, Dodge, DeSoto, and Chrysler passenger cars and Dodge trucks totaled 228,256 vehicles.

Willys Starts Producing Jeepster

About 25 pilot models of the Jeepster, Willys-Overland's new sport phaeton, were produced in May, William E. Paris, vice president in charge of production, disclosed recently. Swinging into mass production in June, the company plans to produce at least 500, with production schedules calling for the completion of between 15,000 and 20,000 by the end of the year. It is believed that the price will range somewhere between the Toledo delivered price of the Jeep, $1276, and the Jeep station wagon, $1764. Formal unveiling of the Jeepster is scheduled for mid-July, when models are expected to be in the hands of dealers.

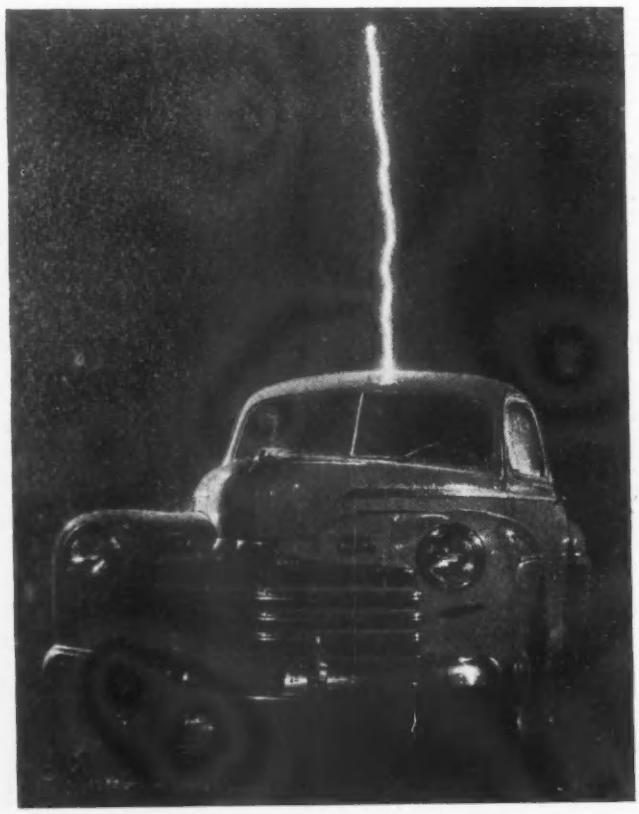
BACK IN THE SERVICE

Part of a special Army order, Willys-Overland Motors' newest version of its Jeep station wagon incorporates the four-wheel-drive feature of the Jeep. It can reportedly negotiate a 57 per cent grade in four wheel drive and is capable of a road speed of 60 mph. The body of the vehicle, with the exception of the olive drab finish, is identical with that of the two-wheel-drive model.

Farm Equipment Demand Continues Strong

Strong demand for farm tractors and implements continues according to both top management officials of Dearborn Motors Corp. and Joseph W. Frazer, president, Graham-Paige Motors Corp. At four regional dealer meetings held recently in Detroit, Philadelphia, Atlanta, and Memphis, Ford Tractor and Dearborn farm equipment dealers said that they expect the farm tractor and implement market to hold firm for some months to come.

At Graham-Paige's annual meeting in Lansing, Mich., Mr. Frazer said that demand for all types of farm equipment is still ahead of production, and that the company now has orders on hand for over 3500 of its new lightweight economy tractor.



LIGHTNING ON THE LOOSE

Three million volts of man-made lightning, produced by a giant surge generator, were fired at this steel-topped automobile in a recent test at the Westinghouse lightning laboratory in Trafford, Pa. Bombarding the car inches above the head of John J. Clark, a Westinghouse engineer, who was seated at the steering wheel, the lightning was diverted harmlessly by the all-steel car, which shielded him from the electric current.

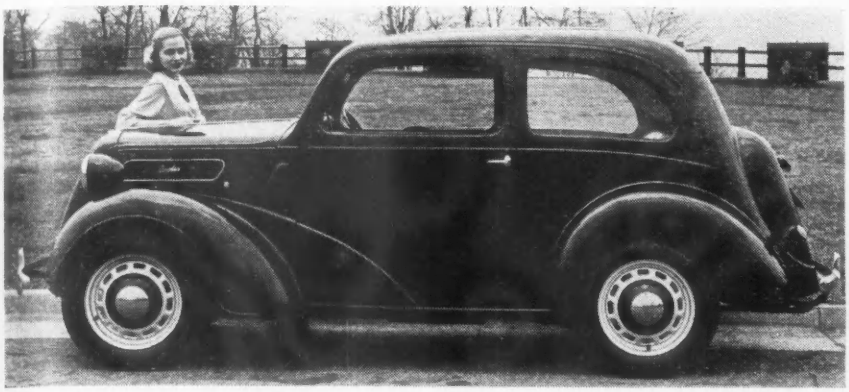
USAF to Test Powerful New Jet Engine

To be test-flown soon at the U. S. Air Force base at Muroc, Calif., the USAF's new J-47A jet engine, designated the TG-190A by the General Electric Co., has a rated thrust of about 5000 lb. An improved version of the G-E J-35, the new jet engine is about the same size and weight as the J-35, but incorporates many design improvements.

Hold ASTM Annual Meeting in Detroit, June 21-25

Representatives of 300 technical groups from all over the United States will present new data on properties of materials and methods of evaluating them at the 51st annual meeting of the American Society for Testing Materials which is to be held in Detroit from June 21 to 25.

NEWS *of the* AUTOMOTIVE INDUSTRIES



AMERICA GETS THE ANGLIA

Produced by Ford at its plant in Dagenham, England, first shipments of the four-passenger, two door Anglia sedan have arrived in the U. S. Powered by a four-cyl, 30-hp engine, the Anglia is said to be capable of speeds up to 63 mph and to average 28 mpg. It has a 90 in. wheelbase.

Ford Family to Preview '49 Ford on June 13

What Henry Ford II has termed "human engineering" will operate on June 13 when the Ford Family Day will be celebrated and over 100,000 Ford employes and their families will preview the new 1949 Ford automobiles. The Detroit metropolitan area employes will bring their families to the test track at Dearborn. At 14 branch assembly plants in the United States, there will be open house during the afternoon of June 13. Branch plants which will have Ford Family Day include those in Atlanta, Ga.; Buffalo, N. Y.; Chester, Pa.; Chicago, Ill.; Dallas, Tex.; Edgewater, N. J.; Kansas City, Mo.; Long Beach, Calif.; Louisville, Ky.; Memphis, Tenn.; Norfolk, Va.; Richmond, Calif.; Somerville, Mass., and St. Paul, Minn. A specially decorated area will be set up at the test track to show the complete line of Ford, Mercury and Lincoln cars and Ford trucks, buses and tractors. A large building will house special exhibits.

Gordano Develops New Sports Car

The Gordano Motor Co. Ltd., Bristol, England, has developed a new 1½ litre sports car, which is scheduled for delivery in 1949. It is powered by a four-cyl engine, and has a wheelbase of 102 in.

GM Sales Top $1 Billion In First Qtr. of '48

Sales of GM Diesel locomotives, GM Diesel engines, Frigidaire products and other non-automotive products in the first quarter of 1948 continued to represent a higher proportion of total volume than in prewar years, Alfred P. Sloan, Jr., chairman of the board, and C. E. Wilson, president, stated recently in announcing first quarter financial results. Net sales in the first quarter totaled $1,089,151,693 as compared with $804,853,209 in the same period last year, while net income was $96,481,412 in the first three months of 1948 as against $60,793,191 in the comparable period in 1947.

Total sales to dealers in the U. S. and Canada and shipments overseas amounted to 536,848 GM cars and trucks for the first quarter of 1948. This compares with 450,227 for the first quarter of 1947. Both GM executives emphasized that in appraising the results for the period, recognition must be given not only to the relatively high level of physical production and employment but also to the inflation which has occurred. They pointed out that the general level of all prices is well above prewar and that GM pay rolls in the first quarter were at a rate that was 175 per cent greater than in the prewar period 1937-1941 while average employment was at a rate nearly 60 per cent greater.

To Hold Paris Air Show In Spring 1949

Organized by the Union Syndicale des Industries Aeronautiques under the auspices of the French Government, the next Paris International Aeronautical Show, the 18th Salon, will be held in the spring of 1949.

Young Radiator Buys Atlas Diesel Plant

The plant and facilities of the Atlas Imperial Diesel Engine Co. at Mattoon, Ill. have been bought by the Young Radiator Co., Racine, Wis., according to F. M. Young, president.

B-W to Handle Export for Hoover Ball & Bearing

The export activities for automotive products of the Hoover Ball and Bearing Co., Ann Arbor, Mich., will be handled by the Borg-Warner International Corp.

TRUCKING BY THAMES

A four-cyl. 30-hp engine powers the Thames Van shown above, made by Ford in Dagenham, England. It is to be available in the U. S. in two sizes equivalent to U. S. one-quarter ton and one-half ton light panel trucks.

NEWS *of the* AUTOMOTIVE INDUSTRIES

AFTERBURNING PIRATE

Already rated in the "well over" 500 mph class, production versions of the Chance Vought XF6U-1 Pirate, Navy fighter, will be equipped with an afterburner, about eight ft in length, to further increase its top speed. An auxiliary jet unit, the afterburner was designed and built by Solar Aircraft Co., San Diego, Calif.

Convair Building New Flying Boat

Designated the XP5Y-1, a new high-performance patrol flying boat, powered by four propeller turbine engines is now being constructed for the Navy by the Consolidated Vultee Aircraft Corp. at San Diego, Calif.

Ethyl Expands Chemical Research Facilities

Research continues to keynote recent expansion plans. Ethyl Corp.'s Research Laboratories in Detroit have revealed the completion of a new Chemical Workshop building which will add about 7500 sq ft of space for chemical products research.

British Car Output Hits New High in March

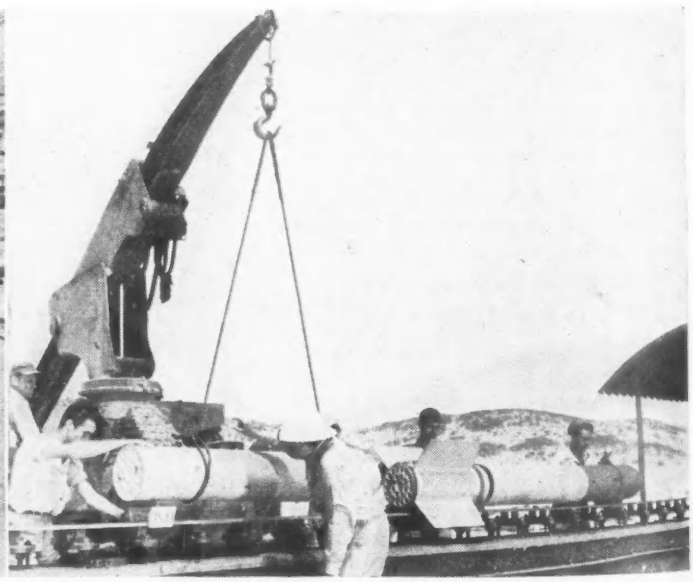
Reaching new export and output highs in March, the British automobile industry produced 32,349 passenger cars of which 23,928 were exported. In December, 24,993 cars were produced. A total of 7488 commercial vehicles were produced for export in March as compared with 5946 in December. On the basis of first quarter returns, Great Britain can claim the title of the world's largest exporter of passenger cars with a total of 56,812 against 55,444 shipped by the U. S.

K-F Earns $2.2 Million in First Quarter

Stating that earnings reflected the rescheduling of production to a one-shift basis, Edgar F. Kaiser, vice president and general manager, disclosed that consolidated earnings of Kaiser-Frazer Corp. for the quarter ending March 31, 1948, aggregated $2,288,000 after provision for income taxes, compared with a loss of $3,-236,000 for the first quarter of 1947. Gross sales for the first quarter of 1948 amounted to $79,095,000 as compared to gross sales of $27,250,000 for the same period of 1947.

New Ford Oxygen Plant to Operate July 1

With a production capacity of 15 million cu ft of oxygen and 54 million cu ft of nitrogen a month, a new plant which will manufacture all the oxygen needed at the Rouge plant of Ford Motor Co. will start production July 1. Major purpose of the plant will be to deliver oxygen at a pressure of 150 psi into the Rouge distribution system which carries the gas to every main building. It will be operated by Air Products, Inc., and is said to be the first plant of its kind in the automobile industry.



RESEARCHING NAVAL ROCKETS

Dedicated recently, the Navy's new Michelson Laboratory at the Naval Ordnance Test Station, Inyokern, Calif., shown in the aerial view at the left, is said to be the most complete science research facility of its type in the world. At the right, a Tiny Tim rocket motor is being lowered onto the launching rails as technicians prepare to fire the Tiny Tim rocket already on the 1500-ft rail launching device

NEWS *of the* AUTOMOTIVE INDUSTRIES

West Coast Lincoln-Mercury Plant in Production

Marking the first time that Lincoln passenger cars have been assembled outside Detroit, 1949 Lincoln and Mercury automobiles are now rolling off the assembly lines at the recently dedicated plant in Los Angeles, Calif. In peak production it is expected that this new plant of Ford's Lincoln-Mercury Div. will assemble 200 cars each eight hour day. At the dedication of the plant, Thomas W. Skinner, general manager of the Lincoln-Mercury Div., said that the plant, when in full production, will add $3.5 million a year to payrolls in this area and will provide employment for at least 1500 men and women. In addition, he emphasized that this plant will contribute to the plan of the Ford Motor Co. to spend $50 million a year on the Pacific Coast for materials and parts, and that the company is already more than halfway toward that goal —currently spending at the rate of $27 million a year there.

Ford Signs Babe Ruth As Consultant

For the second year, Babe Ruth has been signed by the Ford Motor Co. as a consultant in its sponsorship of American Legion Junior Baseball. J. R. Davis, Ford vice president, said, although contract terms were not disclosed, that the Bambino would rank high on the list of baseball's top money earners in 1948.

Packard Nets $1.3 Million In First Quarter

In reporting financial operations for the first quarter of this year, Packard Motor Car Co. disclosed a consolidated net income of $1,304,727, as against a net loss of $1,148,173, without provision for any carry-back tax refund, which was listed by the company for the corresponding 1947 quarter. Car shipments during the first quarter of this year climbed 60 per cent to a total of 17,600 units, compared with 11,018 in the like period of 1947.

British Reveal New Jet Fighter

Details of the latest British jet fighter, the Gloster E.1/44, have now been released. Powered by a single Rolls-Royce Nene engine, the Gloster E.1/44 is a single-seat fighter bearing a strong resemblance to the same company's E.28/39, the first jet aircraft to fly in Great Britain. It has a projectile-like fuselage, with an engine air-intake on each side, the jet at the tail end, stubby mid-wings and equally stubby tail surfaces, and a nose-wheel undercarriage.

CROSLEY POWER FOR AIRWAYS

Built of metal from the nose to behind the pilot's seat and of wood from there to the tail, the M-18, powered by the 26.5-hp Crosley Cobra engine, has been developed by the Mooney Aircraft Co., Wichita, Kans. Featuring a retractable tricycle landing gear, the plane is 18 ft long, has a 27 ft wing span, and weighs 450 lb. It is said that the ultimate selling price will be under $1500.

Predict Near Record for '48 Tire Sales

A prediction that automobile tire replacement sales would continue at near-record levels in 1948 was made by Howard N. Hawkes, assistant general manager of U. S. Rubber Co.'s tire division, who said that industry-wide passenger car tire replacement sales for the April-September period would be close to 26.5 million units, compared with 26,730,000 for the same period in 1947. Truck casing sales for the same six-month period are figured at about 4.5 million units as against 4,860,000 for the peak six months of 1947. Mr. Hawkes stated that with over two million more cars now on the road than there were a year ago, it is entirely possible that tire retail volume may exceed last year's figures.

McDonnell Unveils Tiny Jet Fighter Parasite

The McDonnell Aircraft Corp., St. Louis, Mo., has built a folding-wing jet fighter, the XF-85, Protector Parasite designed for the Consolidated B-36 which will carry the tiny plane in its 16-ft bomb bay. Described as a high altitude intercepter with speeds comparable to other jet fighter aircraft and able to operate at altitudes up to 40,000 ft, the tiny fighter has no landing gear. It features an overhead device which enables it to hook onto the mothercraft in flight at speeds of 200 to 300 mph, and then be hoisted into the B-36's bomb bay. It has a wing span of 21 ft, an overall length of 15 ft, and is powered by a Westinghouse axial-flow turbo-jet engine.

Finletter to Talk at ASME Meeting

Featuring the American Society of Mechanical Engineers' semi-annual meeting in Milwaukee, Wis., Thomas K. Finletter, New York corporation lawyer, will deliver an address on "Air Power and Foreign Policy," on June 2.

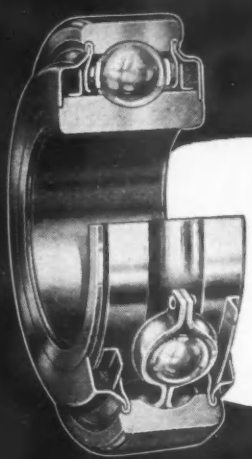
Accredit Ford Trade School As High School

The University of Michigan has granted the rating of an accredited high school to The Henry Ford Trade School operated by Ford Motor Co. Previously, students graduating from the Trade School were required to take extra night school courses to receive an accredited diploma. The University is considered the accrediting agency for the State of Michigan, and it is generally conceded that the rating is accepted by most schools.

(*Turn to page* 88, *please*)

A Million 1948 cars will roll on New Departure Sealed-for-life Rear Wheel Ball Bearings!

why?



Proved by 14 years and billions of miles in actual service.

Because this bearing is proof against neglect or wrong lubrication—because it is self-sealed and lubricated for life.

No abrasive dirt can get in to cause looseness, shorten its life.

No grease can escape to cause slipping brakes.

No bearing adjustment for wear—*ever!*

It is service free—it's *built to be forgotten!*

A booklet of interest to automotive designers and car owners alike will be sent on request.

15-T

nothing rolls like a ball

NEW DEPARTURE
BALL BEARINGS

HELP AMERICA PRODUCE FOR PEACE
Turn in SCRAP

NEW DEPARTURE • DIVISION OF GENERAL MOTORS CORPORATION • BRISTOL, CONNECTICUT

Unfilled Car Orders Greater Than Year Ago

Upsurge of Buying Sends Industry Backlog over Five Million Figure. Millions of Cars Now Over-Age and in Need of Replacement.

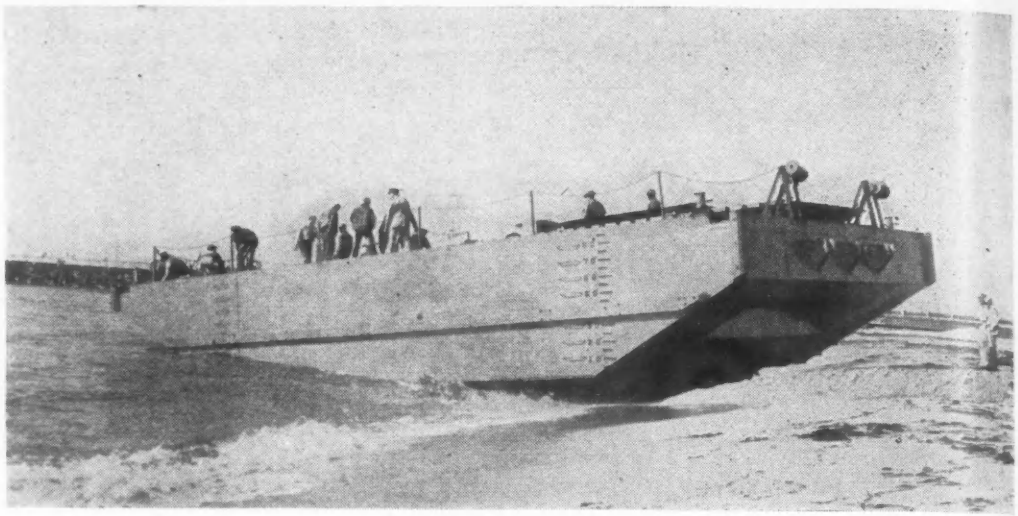
By Leonard Westrate

APPARENTLY it is going to be a long time before the American motorist can shop competitively for the kind of car he wants and get immediate delivery of it. Unfilled orders for new cars have taken an upward surge in recent weeks, and piled on top of an already mountainous stack of older orders, have put the total backlog at the highest level in history. Just what the exact grand total for the industry is at the moment is not known, since not all manufacturers have made numerical estimates of their unfilled orders.

However, adding up the estimates for the various General Motors divisions produces a total of more than 3.17 million. When the estimated 1.6 million orders Ford has on hand are added, the total for the two companies alone stands at nearly 4.8 million. Included in the Chevrolet and Ford computations, of course, are truck backlogs, but these are not considered to be as large as formerly.

Chrysler Corp. says it has made no numerical calculation of the number of unfilled orders its dealers have on their books, but K. T. Keller, president, recently told stockholders that the demand for the company's products never has been greater. On the basis of Chrysler's traditional relative position in sales, it would be reasonable to assume that it has at least a million unfilled orders. Other companies have not made definite calculations of their backlogs, but some have stated that they could not fill booked orders for periods ranging from a year to 18 months. By arriving at a figure for each company on the basis of annual capacity, a conservative guess would be that the independents have on hand between 450,000 and 500,000 unfilled orders, exclusive of Kaiser-Frazer, which may have a small number, but not enough to materially affect the overall total. After adding the backlog of the independents to that of the Big Three and then making a generous allowance of one million orders for duplication and other "water", a fairly safe estimate of the size of the unfilled order backlog for the industry as a whole would stand at between 5 and 5.25 million units.

Even if the industry could produce consistently at the high rate of 500,000 vehicles a month, as it did in March, it would take more than a year just to wipe out accumulated passenger car orders, to say nothing of new business acquired during that time. Total production has been running about 30 per cent trucks. Since these are average figures for the industry as a whole, it would be much longer before some companies, such as Ford, Chevrolet and Plymouth could be even with the board. But a more important factor is that despite the more than seven million passenger cars which have been built since the end of the war, the backlog of orders is larger now than it was a year ago. The upsurge in orders has been particularly sharp in recent weeks. The return of warm weather undoubtedly has had its normal effect on new orders. Also, rumors of impending war have led to reports that automobile companies would be converting to arms production and many persons rushed to order new cars. The rearmament program also (*Turn to page* 58, *please*)



The Navy barge walking out of the surf.

The Walking Barge

120-Ton Vehicle Developed by Navy Can Navigate the Ocean or Traverse Swamps, Sand, Snow and Hard Ground with 60-Ton Load

By J. T. Tucker,
Superintendent,
Naval Advanced Base Proving Ground,
Port Hueneme, Calif.

THE problem of traversing swampy, marshy ground, tidal flats, and other ground of an unstable nature is a difficult one and frequently impossible of solution by means of the conventional wheeled, tracked or present-day amphibious-type vehicles. Many attempts have been made to solve the problem by conventional means, but lack of proper traction, sufficient bearing area on the ground, buoyancy in water with proper freeboard, and low ground clearances are the major difficulties to be overcome.

During World War II, various branches of the Armed Services made use of many types of vehicles and devices for amphibious landings and for traversing unstable and uneven ground. The successful use of these vehicles and devices employed to deposit trucks, tanks, bulldozers, troops and equipment ashore depended upon many circumstances and obstacles which were overcome only with the greatest of difficulty.

Recently a new amphibious vehicle called a Walking Barge has been developed by Navy engineers at the Naval Advanced Base Proving Ground, Port Hueneme, Calif., under the direction of the Navy Department, Bureau of Yards and Docks, which may conceivably change the manner and method of setting up, equipping and making the "roll up" of advanced bases. This new device shows promise of being useful also in many other fields.

The Walking Barge is designed to carry 60 tons of men and equipment over sand, soft and hard ground, oozy-to-liquid mud, tide-

Outboard pontoons at the height of "step".

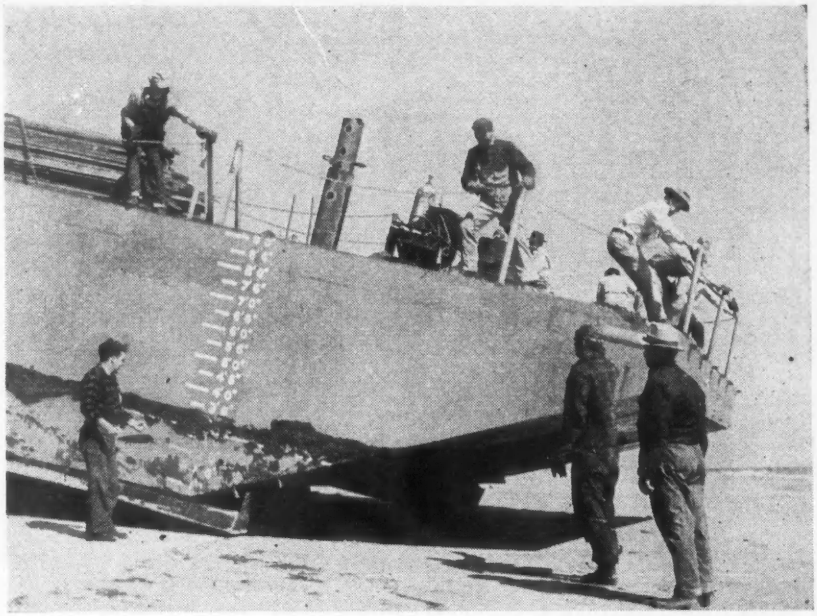
lands, surf, ocean, and ice and snow. The model now undergoing tests at the Advanced Base Proving Ground weighs 125 tons and has a clear deck space of 28 ft by 60 ft. It has successfully traversed mud flats where the bearing pressure was estimated to be about one-half pound per square inch. In addition, tests have shown that the barge can climb a 25-degree slope, cross sand dunes, climb over abrupt vertical walls of sand seven ft in height, and go through four- to five-ft surfs. Its speed on land is 0.75 mph and in water, four knots.

Of all-welded construction, the barge consists of three pontoons placed side-by-side. The two outboard pontoons are each 60 ft long, six ft wide, and nine ft high. Between them is the inboard pontoon, 16 ft wide, 44 ft long and six ft high. These hulls are framed with four-in. structural steel angles. Plating covering the frames is 0.188 in. thick on the sides and 0.25 in. on the bottoms. The pontoons are divided into water-tight compartments.

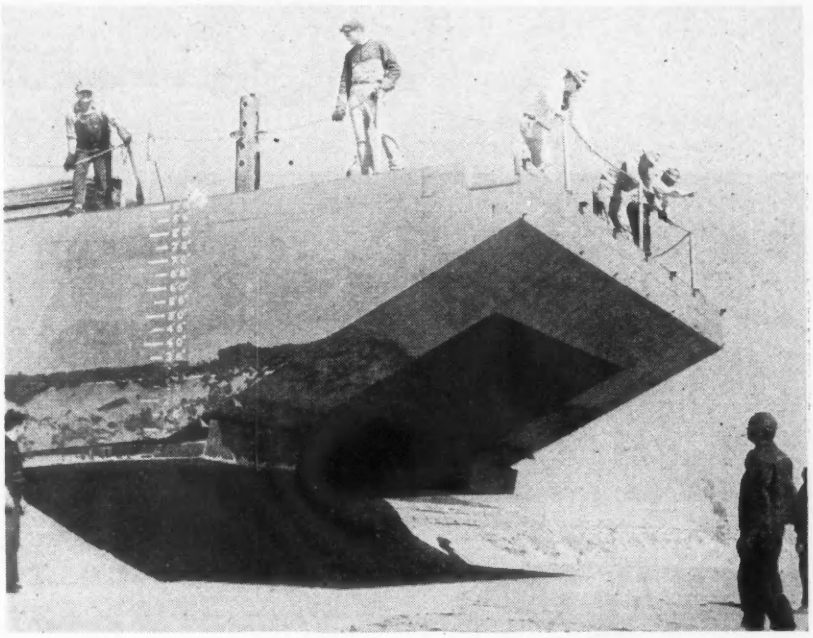
In appearance the barge might be likened to a turtle, but its action on land suggests the movement of a frog humping itself cautiously forward. First, the inboard pontoon is lifted 17 in. off the ground, it moves forward 10 ft at this level, and then it is lowered to the ground. The inboard pontoon is followed immediately by the outboard pontoons which are decked over and carry the payload. This part of the structure surges upward and forward in the same manner and comes to rest once more in its original position over the inboard pontoon. To create a lever action which assists in reducing the initial force required to lift the outboard pontoons in the first stage of a forward step, the stern bottom of each outboard pontoon is flared upward 7½ in. for a distance of 10 ft. The official Navy Photographs in this article show the walking barge in operation over various types of terrain.

Steering pads controlled by hydraulic cylinders are built into the stern of each outboard pontoon for steering on land. Used singly, they act as a pivotal drag which causes the barge to turn.

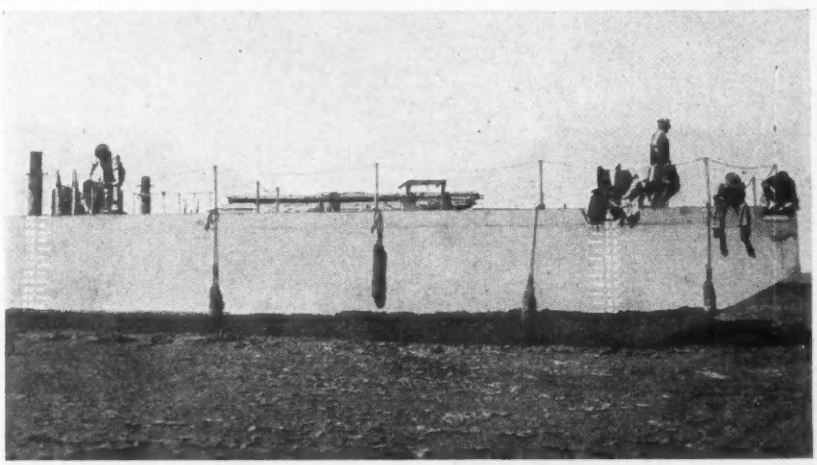
(*Turn to page 74, please*)



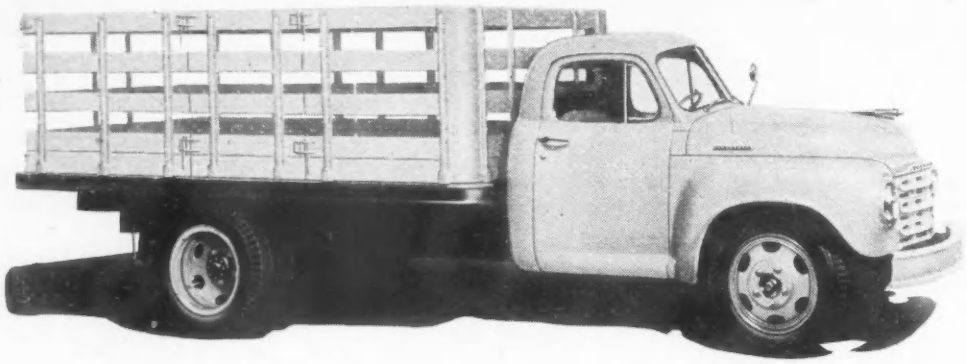
Starting to climb a five-ft bank.



Completing climb over five-ft bank.

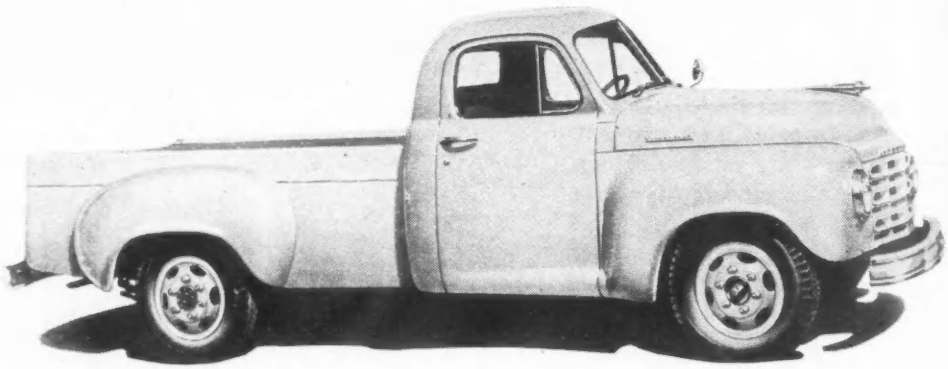


Wading through slough with oozy-mud up to the 3.5-ft water line.



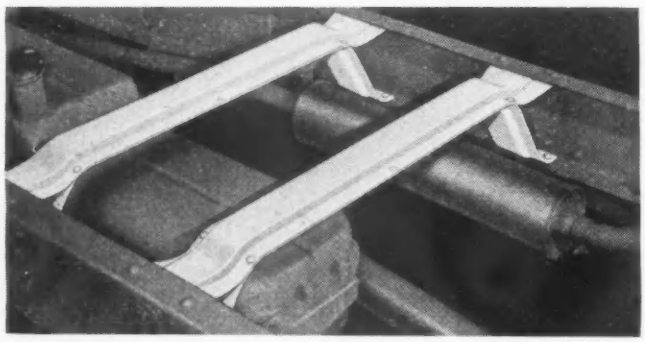
The new Studebaker trucks in the heavier duty category offer two capacity classifications, the 1½ ton having 14,000 lb and the 2-ton with 16,000 lb gross rating. Available are four wheelbases — 131, 155, 171, and 195 in.

New to the Studebaker line for 1949 is this ¾-ton pickup. It is equipped with a steering-column gearshift lever.



Studebaker

By Joseph Geschelin



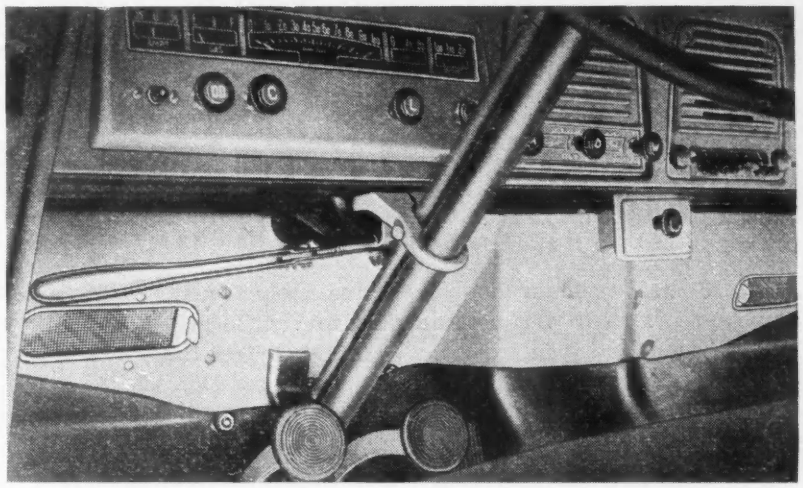
(Above) These box-section cross members give greater strength and rigidity to Studebaker truck frames. Their alligator jaw ends are riveted to the upper and lower flanges of the frame side rails.

Accessibility of instruments, gages, electrical wiring and engine accessories is shown here.

THE 1949 line of trucks announced by The Studebaker Corp. covers a wide range of models and ratings, with 12 wheelbases. Additions to the line include—new ¾-ton and two-ton models, while the 1½-ton series has added to it a 171-in. wheelbase chassis that takes either a 14- or 15-foot body.

The complete line comprises the following models: ½-tonner with a wheelbase of 112 in.; new ¾-tonner with 122-in. wheelbase; one-ton model on 121 and 131-in. wheelbase; and the 1½-ton and new 2-ton models mounted on four wheelbases—131, 155, 171, and 195 in. Maximum GVW ratings range from 4600 to 16,000 lb.

In offering this new line of trucks, Studebaker has given special attention to increased driver comfort by unique design features in the cab and by improving the ride through the adoption of longer and more flexible springs. To improve accessibility for maintenance and inspection, engine accessories and other elements have been located more conveniently. All wiring and instruments are accessible from beneath the hood. The big hood opening provides ample room



At left of steering column, just below dash, can be seen new-type parking brake on the ½-ton and ¾-ton models.

for reaching the engine from all angles. Here are some major features of the various models.

HALF-TON—Powered by the Studebaker six-cylinder Econ-o-miser truck engine, this vehicle carries 6.00-16 four-ply tires. Three-speed transmission is supplied with steering-post remote control gear shift. Four-speed transmission and overdrive transmission are optional equipment. The rear axle is of semi-floating type with hypoid drive. Front and rear springs are longer. Shock absorbers on the front and rear are standard. Brakes are self-adjusting and self-centering. Pick-up and stake bodies are 6½-ft long.

THREE-QUARTER TON—Maximum gross rating of 6100 lb, powered by the Studebaker Econ-o-miser engine. Eight-foot pick-up and stake bodies. The extra-heavy truck-type full-floating rear axle has a spiral bevel drive. Rear springs are wider than those on the half-ton and have one extra leaf which increases the normal load capacity by 250 lb. Transmission is the same as on the half-ton model.

Expands Truck Line for '49

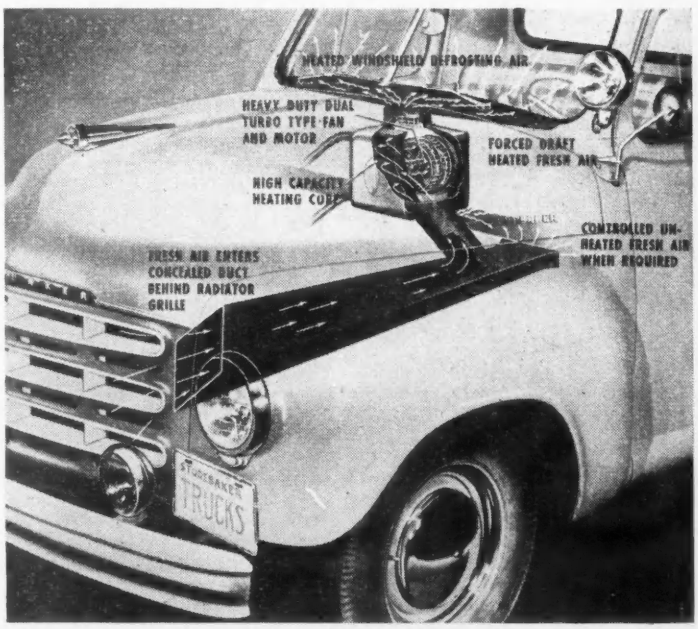
ONE-TON—The 121-in wheelbase model has a maximum gross rating of 7800 lb and carries eight-foot pick-up and stake bodies. The 131-inch wheelbase model has a maximum gross rating of 10,000 lb and carries a nine-ft stake body. Like the three-quarter ton truck it has the Econ-o-miser engine. Four-speed transmission is standard. Front axle capacity is larger than before. Lockheed hydraulic front brakes are used. Rear brakes are Wagner Hi-Tork hydraulic.

ONE-AND-ONE-HALF TON — This series has a maximum gross rating of 14,000 lb and uses the Studebaker six-cylinder Hy-Mileage engine. Cooling system capacity is increased by 2½ quarts to 15½ quarts. The front axle is heavier than in the previous model. Turning radius is reduced.

TWO-TON—With a maximum gross rating of 16,000 lb this series uses the Studebaker Hy-Mileage engine. Extra-heavy full-floating rear axle with hypoid drive is standard. Heavy-duty frames are reinforced by fish-plates. Both the two-ton and one-and-one-half ton models are available with 9, 12 and 14-ft. stake bodies.

Engines remain unchanged from the standpoint of mechanical specifications and are the same as listed in AUTOMOTIVE INDUSTRIES, March 15, 1948. The engine on the ½, ¾, and one-ton models is six-cylin-

(*Turn to page* 64, *please*)


HEATED WINDSHIELD DEFROSTING AIR
HEAVY DUTY DUAL TURBO TYPE FAN AND MOTOR
FORCED DRAFT HEATED FRESH AIR
HIGH CAPACITY HEATING CORE
CONTROLLED UNHEATED FRESH AIR WHEN REQUIRED
FRESH AIR ENTERS CONCEALED DUCT BEHIND RADIATOR GRILLE
STUDEBAKER TRUCKS

Phantom drawing shows the all-weather heating, defrosting and ventilating system in '49 Studebaker trucks.

Gas Turbines for Automobiles

Dual-Cycle Gas Turbine Has Practical Application in Passenger Cars And Offers Many Advantages Over Piston-Type Engine

By F. L. Schwartz

Associate Professor, College of Engineering, University of Michigan

THE dual-cycle or double turbine arrangement appears to be the best adapted to vehicle propulsion, and it offers many advantages over the reciprocating engine. The dual cycle, illustrated in Fig. 1, has one turbine for driving the compressor and one for supplying external power. This latter turbine can be geared directly to the driving axle. The compressor and compressor turbine could be conveniently arranged to suit the body design of the vehicle, but should be placed as close to the driving axle as possible. The separate compressor turbine could run at nearly constant speed where it would have its optimum efficiency, yet the power turbine could fluctuate in speed from zero to maximum. Thus, a minimum amount of inertia would be directly coupled to the axle.

About 60 per cent of the total power generated in the two turbines is supplied by the compressor turbine. Since this turbine produces the major portion of the power and can run at nearly constant speed, it is capable of operating near its peak efficiency at all vehicle speeds. The smaller power turbine which runs at varying speeds will have varying efficiency. This dual-cycle arrangement thus has a better efficiency than the simple cycle which would have only one turbine to drive both the compressor and the vehicle and would necessarily have a varying speed with poor efficiency at the lower speeds. Relative specific fuel consumptions for the two cycles are shown in Fig. 2. The dual cycle not only has a better fuel consumption at low speeds, it is the only cycle which is capable of producing torque at speeds much below 40 per cent of full speed without an automatic transmission.

The gas turbine would occupy about two thirds the volume of an equivalent reciprocating engine. It would be lighter in weight and would require no cooling water, thereby saving the fan horsepower and eliminating the need for a radiator.

The lubrication requirements of the gas turbine are small. The only parts needing lubrication are ball or roller bearing on the compressor and turbine shaft. The consumption of lubricating oil is less than four per cent of that required for Diesel engines.

The gas turbine can handle a reasonable amount of dust without deleterious effects on the blades. Dust particles less than 100 microns have no injurious effect unless they become molten in the combustion chamber. If the particles do melt their diameter should be held to less than five microns. Also, the gas turbine can use poorer grades of fuel than Diesels. Bunker C fuel has been used successfully.

Another advantage of the dual gas turbine is that it has a smooth torque and a very desirable torque characteristic. Also in its favor are: simplicity, no need for cooling water or anti-freeze, pure rotation, low first cost when further developed, and limited maintenance. Thus the gas turbine becomes an interesting power plant for vehicles.

The principal disadvantage of the gas turbine without regeneration is its fuel consumption, especially at part load. However, because of the use of lower grade fuel and small consumption of lubricating oil, the fuel costs are competitive with Diesels and spark ignition engines. The gas turbine requires about 35 lb of air per hp-hr

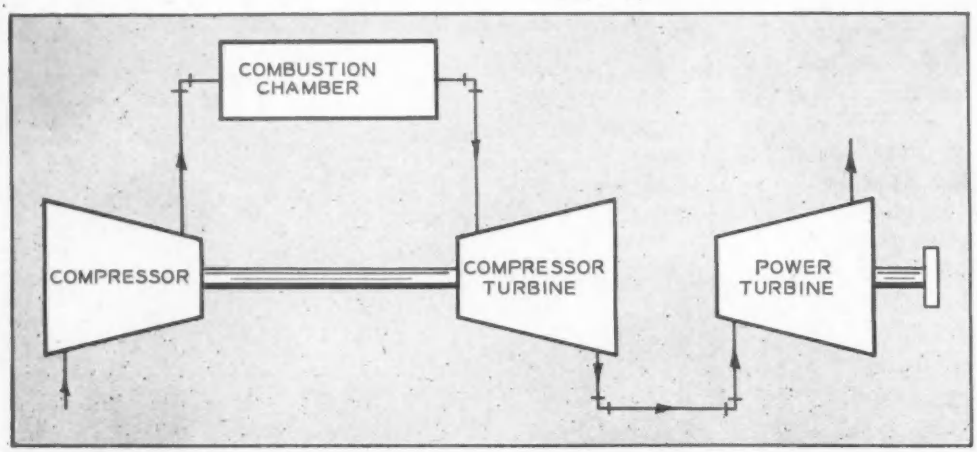


Fig. 1—Schematic diagram of the double-turbine arrangement for vehicle propulsion. The power turbine is geared directly to the driving axle.

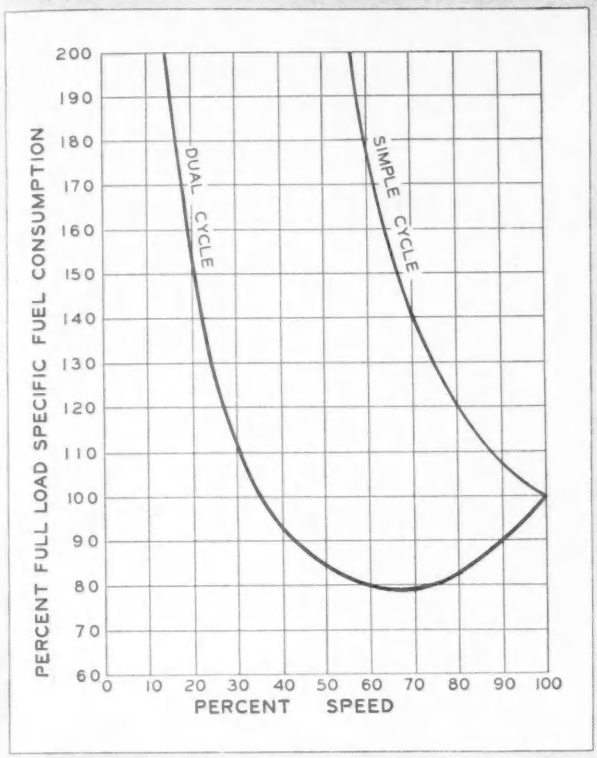


Fig. 2—Specific fuel consumption curves for the simple cycle and dual cycle turbines.

compared with seven lb of air per hp-hr in the reciprocating engine, but if the cooling air for the reciprocating engine is added, the two types of prime movers use about the same air quantities.

The auxiliaries required by a gas turbine are a starter, generator for battery charging, oil pump, fuel transfer pump, injection pump, a fuel regulator and governor. Starting is relatively simple.

Performance curves of a standard passenger car, showing tractive effort or force vs. speed with the three gear ratios, are given in Fig. 3. The engine itself has a nearly constant torque with speed variation, as shown by the third gear curve. To provide adequate torque for rapid acceleration and hill climbing, two other gear ratios are used. The envelope of these torque curves would form a hyperbola of constant horsepower with the ideal transmission if the torque were multiplied by the car speed (mph) and a constant.

The maximum efficiency and power of the power turbine are obtained at running speeds of about one half the runaway speed. However, if the turbine is designed to give the desired torque at about 70 per cent of the runaway speed, the efficiency of the turbine is maintained at a high value over a range of 35-70 per cent of the runaway speed or 50 to 100 per cent of the range of vehicle speeds. The maximum turbine efficiency is obtained at about 75 per cent of the maximum vehicle speed; the torque-speed curve for this condition is shown by the lower line of Fig. 3. A more important consideration is the improvement in torque characteristic. By moving the design point to 70 per cent of runaway speed the stall torque will be almost four times the running torque at maximum speed, as shown by the upper turbine line of Fig. 3.

Excepting at speeds below 30 mph the turbine torque is superior to the multiple gear transmission. At low speeds the torque could be improved for short periods of time by raising the temperature in the combustion chamber.

(*Turn to page 77, please*)

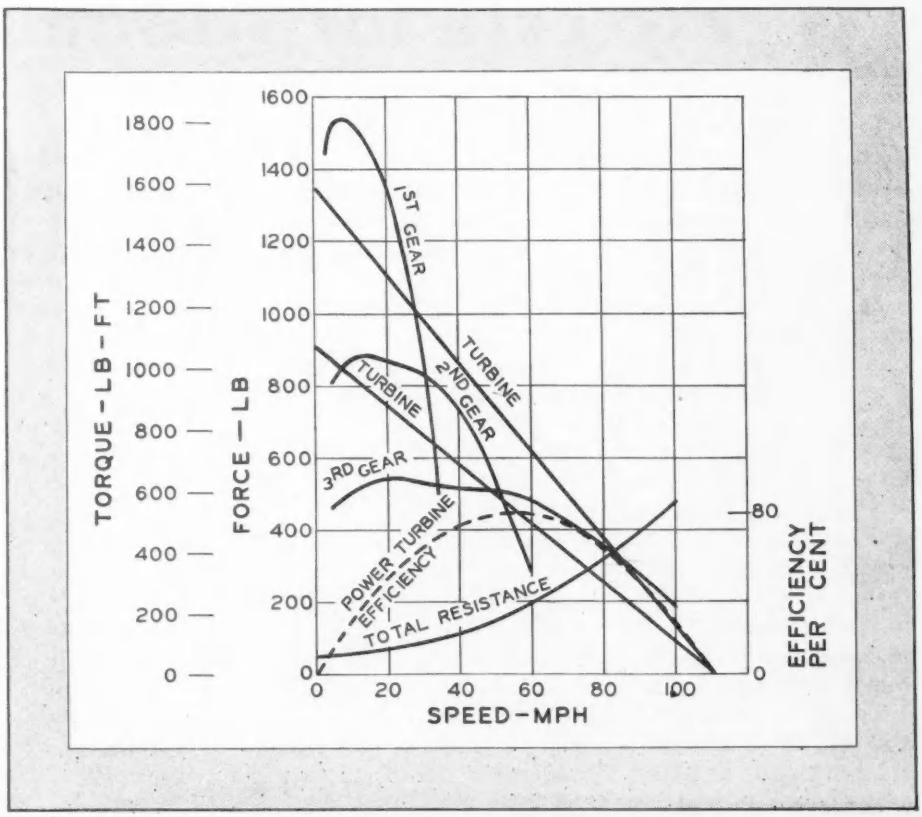
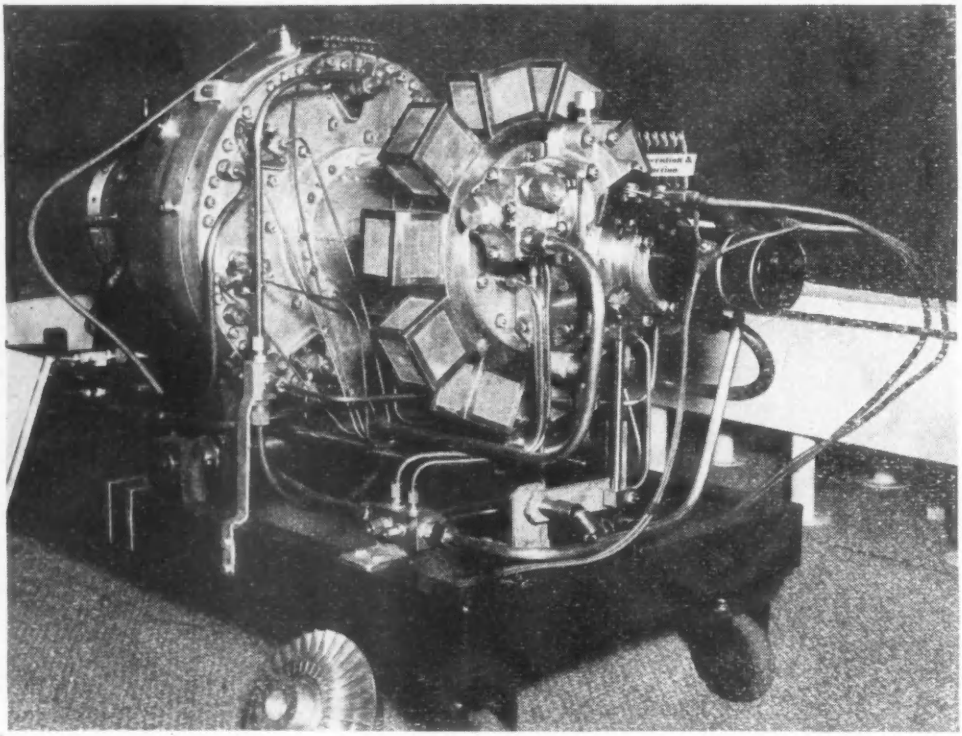


Fig. 3—Performance curves for a standard passenger car, showing tractive effort of the three gear ratios, total resistance of the car, and performance characteristics of two gas turbine designs. The power turbine efficiency curve, representing the maximum efficiency of this unit for various vehicle speeds, was constructed with the torque of the turbine equal to that of the car at its maximum speed in third gear. The lower turbine line gives characteristics of the turbine when designed for maximum efficiency, and the upper turbine line is for the turbine designed for maximum speed.



Centrax compressor and combustion unit of gas turbine being developed for road vehicles. It was displayed at recent British Industries Fair. (British Combine photo)

By W. F. Bradley
Special European Correspondent for AUTOMOTIVE INDUSTRIES

British Disclose Gas Turbine Projects for Automobile Power

ATTENTION has been focused on the use of gas turbines for road vehicles by an exhibit at the British Industries Fair of a unit designed and produced by the Centrax Power Units Limited. The decision to exhibit was taken at the last moment by the Ministry of Supply and must be regarded as a propaganda measure. The unit on display was the gas generator consisting of compressor and combustion chambers, lacking the turbine wheels and reduction gear needed for a complete automobile gas turbine. In its present stage of development it is estimated that another two or three years of experimental work will be necessary.

The Centrax, which is expected to develop 160 hp, will have a weight variously stated as 250 to 350 lb, with turbo compressor, combustion chambers, power turbine and reduction gear. Its overall length is 60 in. and diameter 17 in. Having a design speed of 40,000 rpm, it employs an eight-stage axial flow compressor, with a final centrifugal stage compressor driven by a two-stage turbine. The generator unit also will drive a single-stage power turbine, mounted independently, at about 35,000 rpm. The reduction gear gives a drop of 7 to 1, bringing the output shaft speed down to 5000 rpm.

Starting is by a small 24-volt electric motor at the front of the turbo-compressor and an igniter plug. Air is admitted through ten ports mounted radially behind the starter motor, each one being protected by gauze, with provision to prevent collapsing under intake pressure. The air passes through an axial compressor, the drum of which revolves in the casing forming the center section of the unit, then through the centrifugal compressor housed in the rear. Passing through a diffuser, the air enters an annular casing containing seven flame tubes. Seven burners project into these tubes. Immediately before the turbine nozzle the seven flame tubes merge into a complete annulus and the products of combustion pass into the nozzle, through the first and second stages of the turbine to an annular duct forming the rear end of the unit. Fuel oil is continuously delivered to the burners from a gear-type pump, control being by spill valves.

During the exhibition it was revealed that the Rover company, automobile manufacturer, also has a gas turbine in hand developing 100 hp, having a normal speed of 55,000 rpm, and weighing 475 lbs complete with gearbox and clutch. The Rover embodies two independent turbines, one driving the air compressor, while the second, on a separate shaft, furnishes the power output. The turbine wheel has a diameter of 5 in., overall length is 36 in., width 18 in., and height 20 in. It has a single combustion chamber and a heat exchanger. It is claimed that units of the Rover have been run 60 hours under test and that the turbine is sufficiently developed to allow it to be fitted in an automobile. There are no indications that this will be done in the near future.

"HIDDEN PAYROLL" COSTS

Extra Payments by Automotive Parts Companies 38½ Per Cent Higher in 1947

AUTOMOTIVE parts manufacturers paid their wage earners 12½ cents per hour over and above the direct wages for every manhour worked during 1947. These reported payments amounted to in excess of $45,000,000 and if this same money had been spent in direct wages at $1.50 per hour it would have purchased 30,000,000 man-hours of work or 15,000 man years of work at 2000 hours per year.

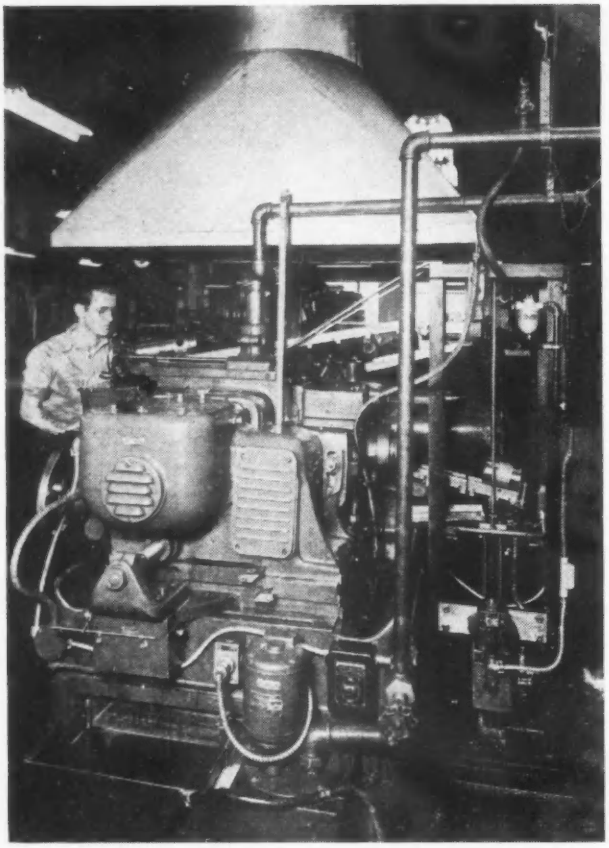
These "hidden payroll" costs consist of collateral payments made to, or the direct benefit of hourly paid factory employes. The above payments were made by 163 parts companies operating 198 parts manufacturing plants in the United States, the 12½ cents per hour over-all average cost amounting to approximately 38½ per cent higher than the cost of the same collaterals paid in the 184 of these same plants in 1946. It is estimated that this item of cost will increase substantially in 1948.

In the Detroit area the 1947 over-all average costs to 40 companies operating 69 plants amounted to 13.616 cents per hour, for the remainder of Michigan 11.028 cents per hour. At 75 parts plants in Ohio, Indiana, Illinois, Wisconsin (*Turn to page 72, please*)

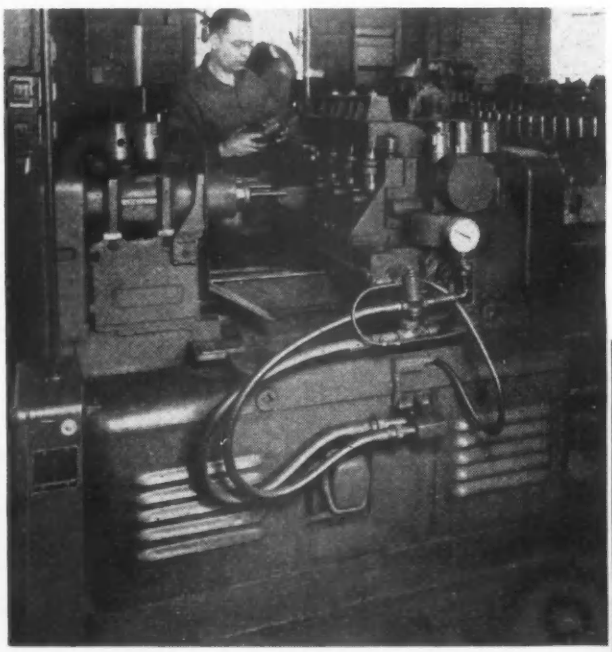
Cost of Collateral ("Fringe") of Miscellaneous Payments Made To, or For The Benefit Of, Hourly-Paid Factory Employes in the Automotive Parts Industry.

The data on this sheet pertain to reports submitted by 163 companies covering 198 parts manufacturing plants in THE UNITED STATES which plants provided, in 1947 more than 359,782,000 manhours of work for factory employes and paid out more than a total of $45,127,000 for these collateral items.

	YEAR OF 1947		
	NUMBER OF PLANTS REPORTING PAYMENTS IN THIS CATEGORY	AVERAGE COST (cents per hour) PER MAN-HOUR WORKED IN ONLY THOSE PLANTS WHICH REPORTED PAYMENTS IN THIS CATEGORY	OVERALL AVERAGE COST (in cents per hour) PER MAN-HOUR WORKED IN ALL 198 PLANTS —REGARDLESS OF HOW MANY OR HOW FEW REPORTED MAKING PAYMENTS IN THIS CATEGORY
A. VACATION PAYMENTS: a. Paid vacations	135	4.099c	.....
b. Bonus in lieu of vacation	61	4.412c	.....
TOTAL	196	4.211c	4.206c
B. CHRISTMAS OR OTHER SPECIAL BONUSES OR PROFIT-SHARING PAYMENTS, ETC. (Does NOT include regular incentive or production bonuses which are properly reportable as direct wages)	65	1.457c	0.454c
C. PAYMENTS FOR HOLIDAYS NOT WORKED:	124	2.551c	1.947c
D. PAYMENTS TO UNION STEWARDS OR OFFICIALS FOR TIME SPENT IN SETTLING GRIEVANCES OR IN NEGOTIATING AGREEMENTS:	94	0.238c	0.162c
E. LEGALLY REQUIRED PAYMENTS—EMPLOYER'S SHARE ONLY: a. Old age and survivor's insurance	193	1.577c	.....
b. Unemployment compensation (net)	191	2.823c	.....
c. Workmen's compensation	193	0.830c	.....
TOTAL—SECTION E	...	.....	4.975c
F. VOLUNTARY (OR AGREED-UPON) PAYMENTS BY EMPLOYER—EMPLOYER'S COST: a. Pension plan premiums	12	2.883c	0.147c
b. Pension payments not covered by insurance-type plan	4	0.259c	0.003c
c. Life insurance premiums	84	0.341c	.....
d. Death benefits not covered by insurance	0	.....	.....
e. Sickness, accident or medical care insurance premiums	26	0.285c	.....
f. Sick-leave pay, accident or medical care payments not insured	10	0.352c	.....
g. Hospitalization insurance premiums (including cooperatives such as Blue Cross)	28	0.370c	.....
h. Hospitalization payments not covered by insurance plan	4	0.031c	.....
Payments covering c, e and g which companies were unable to segregate by classes	23	0.798c	.....
Payments covering e and e which companies were unable to segregate by classes	15	0.169c	.....
Payments covering e and g which companies were unable to segregate by classes	4	0.477c	.....
Payments covering f and h which companies were unable to segregate by classes	1	0.109c	.....
SUB-TOTAL: All benefit plans (other than pensions) regardless of whether of insured or non-insured type included in c to h inclusive and including non-segregated payments for these same categories	...	.....	0.614c
i. Separation pay allowances	2	0.015c	0.000c
j. Other	6	0.327c	0.035c
TOTAL SECTION F. (Voluntary Payments, etc.)	...	.....	0.799c
G. GRAND TOTAL			12.543c



Cincinnati Centerless grinder on the Como piston line finishes the outside diameter in two passes. The return mechanism mentioned in the text lifts the piston—automatically—to the level of the chute near the top of the fixture at the extreme right, permitting the work to return to the operator for racking.



(Above) Double-end, three-station Heald Bore-Matic in the Como plant handles the precision boring of the wrist pin hole in pistons, taking three at a time.

(Right) This is one of two General Electric "Electronic Heaters" used for induction on hardening of a large variety of parts.

Quality Control

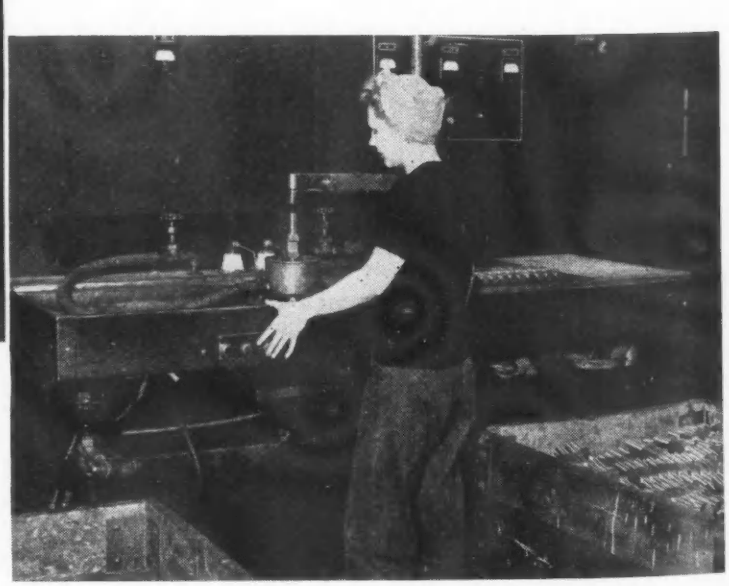
How Minneapolis-Moline Has Adapted Statistical Methods to Small Lot Operations With Highly Beneficial Results

By Joseph Geschelin

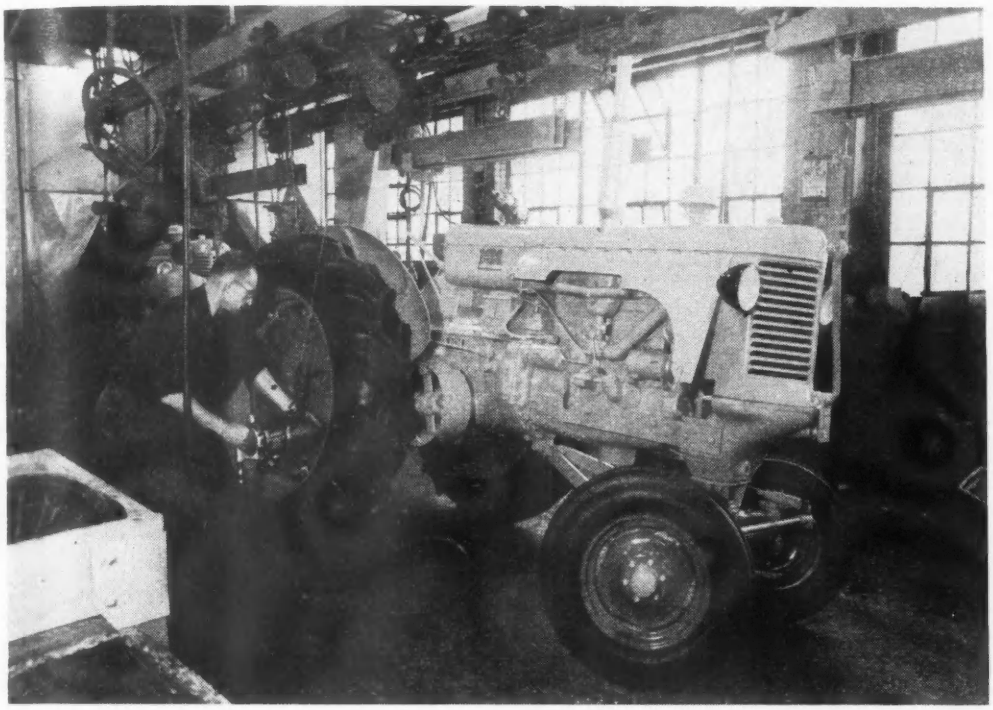
QUALITY control based upon statistical methods has been applied successfully in the tractor plant of the Minneapolis-Moline Power Implement Co. coincidentally with the evolution of a major program of expansion of facilities, modernization of equipment, and general plant rearrangement.

Contrary to the impression that statistical control can be applied only to manufactured lots measured by the thousands, the simple system employed here is applied to relatively small lots —counted in hundreds of units. While still in its experimental stages the control system has reduced spoilage, improved the general level of quality, and has aroused the interest of machine operators as well as supervisory personnel.

The system in effect here is the simplest form of statistical control, based upon the elementary control chart. The chart is a live record built up of points plotted every hour by an inspector. The chart consists of a "zero" line representing the basic size of the part with two limit lines repre-



in a Tractor Plant



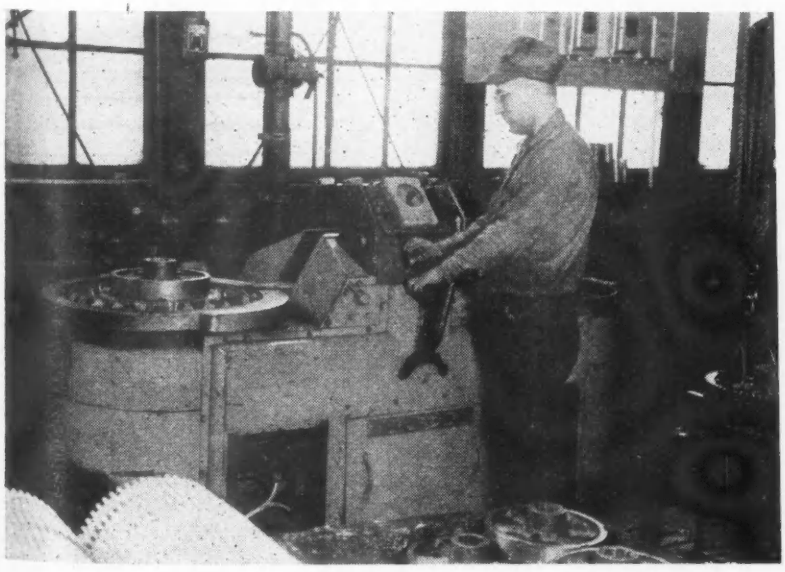
Putting the finishing touches on an M-M tractor while it is still suspended from the heavy-duty monorail conveyor fresh from the trip through the drying oven.

senting the maximum limits of variation—plus or minus. As long as the points remain within the boundary of the limit lines, the operation is considered as being in control; any points outside of the limit lines are evidence of trouble—loss of control—and are subject to immediate investigation.

Short-cutting the pros and cons of a radical method M-M contracted with a specialist, Dr. J. N. Berrettoni to act as a consultant in setting up the procedure. The actual introduction of the system in various departments is handled by one of his assistants who stays with the job until the people in the department understand the procedure thoroughly.

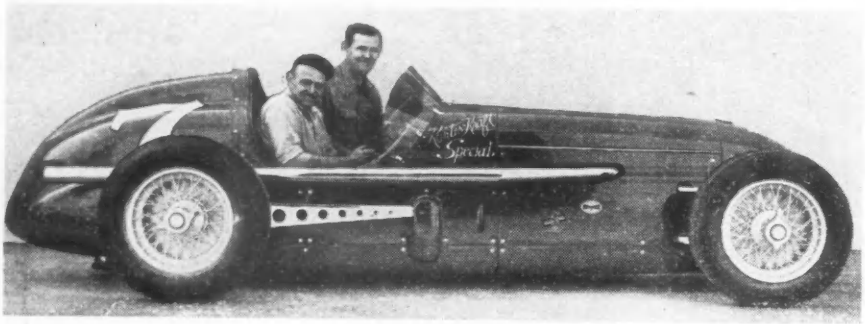
The most impressive thing about this venture is the application of quality control to every aspect of foundry operation, M-M having its own foundry facilities adjacent to the machine shops. So far as we can recall this is one of the first foundry applications we have observed. Control of the gamut of foundry operations is so new in fact that the system is considered strictly experimental. Since many of the variables require further study to determine their practical limits, this control is considered an im-

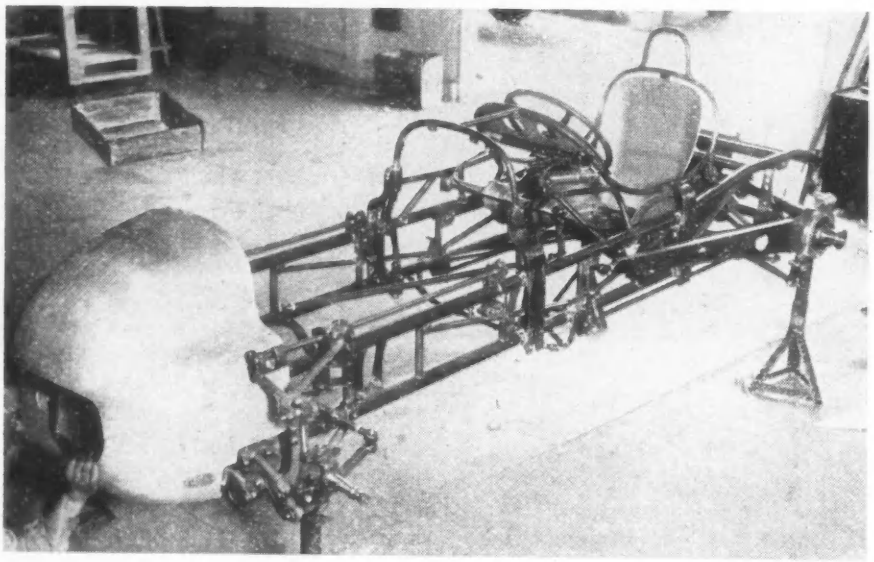
(*Turn to page* 66, *please*)

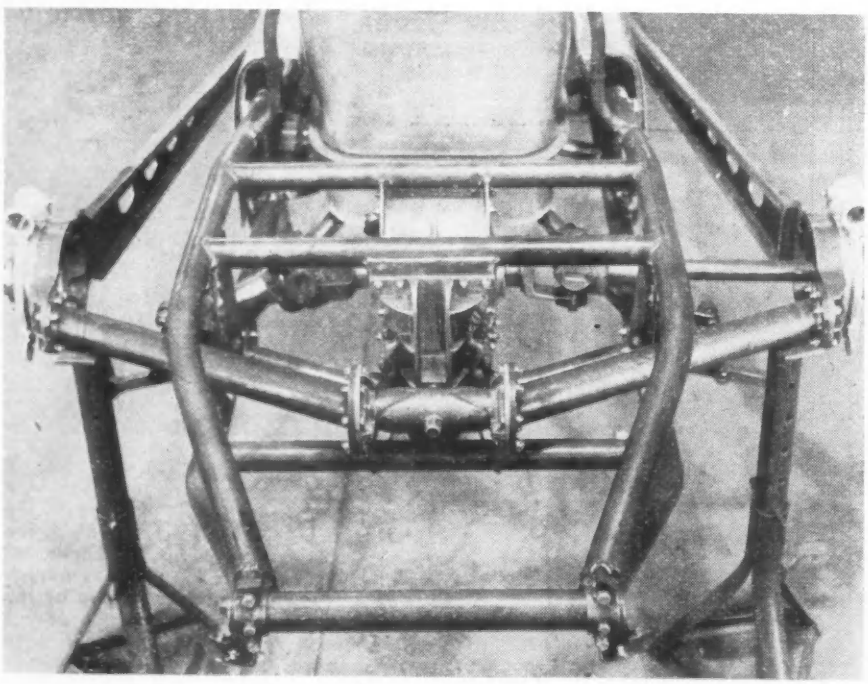


(Left) Designed and built by M-M the unit shown here is used for the hardening of bull ring gear teeth in the gas burner section at the right; and quenching at the left. The station at the left also serves as the means for fitting the gear onto the hub and web with a shrink fit.

A Specialist in Race Car Design for Years, John Bond in This Exclusive Article for AUTOMOTIVE INDUSTRIES Evaluates the Current Engineering Trends in Indianapolis and Dirt Track Racers and Advocates Greater Emphasis on Stock Car Racing







By John Bond,
Kurtis-Kraft, Inc.
Chief Engineer,

Important

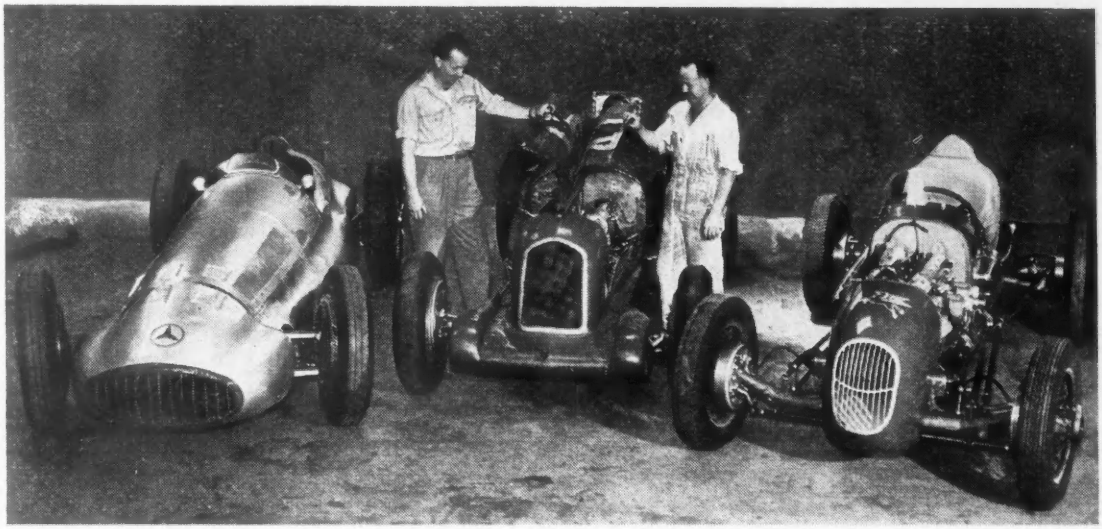
RACING car development, like that of passenger cars, is more one of evolution than revolution. It is, of course, axiomatic that design changes and improvements are for the purpose of "getting around" faster than the other fellow.

Before attempting an enumeration of design changes or trends in American racing cars it might be well to state the type of competition for which they are intended. In this coun-

(Top Left) This new Kurtis-Kraft Special is powered by a Meyers-Drake four-cylinder engine of 270 cu in. displacement. At the wheel is Harry Stevens, mechanic, with Frank Kurtis, builder, next to him. Weighing 1820 lb, it is equipped with torsion bar suspension at front and rear. (L. E. Evans photo)

(Center Left) Tubular frame completely welded into one unit is the latest type being adopted for racers because of its rigidity and light weight. Shown here is the Kurtis-Kraft chassis of tubular construction. (L. E. Evans photo)

(Bottom Left) Rear of the Kurtis-Kraft chassis showing its De Dion type rear axle. (L. E. Evans photo)

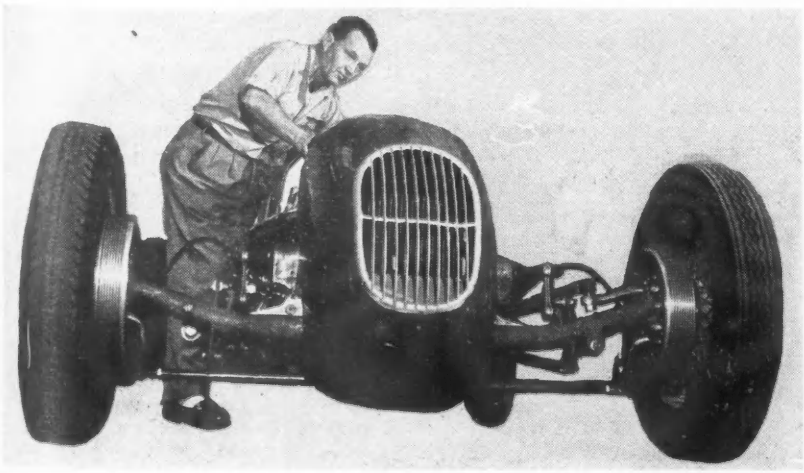


The three Don Lee entries in the 1948 Indianapolis race. (Left to right) Mercedes V-12, Alfa Romeo, and new Don Lee Special. The Mercedes is the same car in last year's race (see June 1, 1947 issue, page 24, AUTOMOTIVE INDUSTRIES). It has a 182 cu in. supercharged engine, which has been placed in practically new condition. The Alfa-Romeo engine is an eight-cylinder, 177 cu in. supercharged engine.

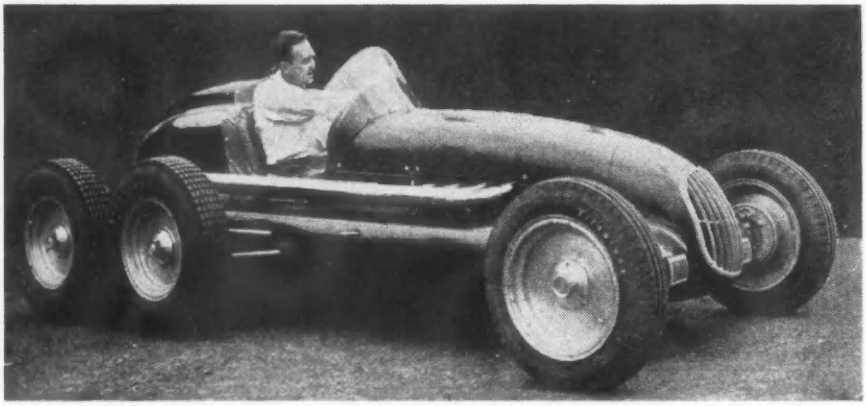
1948 Innovations in Racing Car Design

try, automobile racing is confined solely to track racing. Tracks are the ¼ mile oval for the mighty midgets, ½, ⅝ and one mile ovals (usually dirt) for so-called "big car" racing, and, of course, the 2½ mile circuit at Indianapolis. While the overall racing picture is somewhat confused and unsettled at the moment, a classification of cars can be made by dividing them into four general categories:

1. Midgets, which have certain limitations as to dimensions and engine size.
2. Dirt Track Cars—confused, but usually limited to 220 cu. in. engines.
3. AAA Circuit Cars—latest revisions permit anything from midgets to 183 cu. in. supercharged or 275 cu. in. unsupercharged. For 1948 the AAA cars are sanctioned to run not only the 500 mile event at Indianapolis but 15 other events of 100 to 200 miles on one mile dirt tracks throughout the country, as well as the annual Pikes Peak Hill Climb.
4. Stock Cars—this classification should be included because it is the most rapidly growing of any branch of the sport. So-called stock car racing also presents a muddled situation throughout the country, in that there are three schools of thought. Most prevalent is hot rod, roadster, or modified stock car racing as practiced in California and Indiana. Considerable engine and chassis modification are allowed and bodies are old roadsters. The second type of "stock" car racing, most prevalent in and around the southwestern states, allows engine souping but requires late model stock chassis and enclosed bodies. The third type is genuine stock—no modifications of any kind. Since no one has ever been able to define a "stock car" adequately, a host of problems arise which are too involved to take up here. However, I do believe that some form of stock car or even "sports car"



From end of the new Don Lee Special powered by a Meyers-Drake unblown 270 cu in. four-cylinder engine with two overhead camshafts. It is reported to develop 290 hp at 4500 rpm. Wheelbase is 96½ in. and weight 1450 lb. Among its features are independent torsion bar suspension, welded tubular frame and aircraft type rubber fuel tanks



Among the Indianapolis entries was this unusual six-wheel racer powered by a 270 cu in. Offenhauser engine. (Acme photo)

racing should be evolved in order to improve production type automobiles.

Realizing that except for Pikes Peak, all events are run on tracks, it is apparent that design innovations are not as prolific as if, for example, we also had European style road-racing which tests every component of the chassis to the utmost.

Perhaps the most significant improvement in American racing cars had its beginning with the importation of the Maserati by Mike Boyle and H C. "Cottin" Henning in the 1930's. The immediate success of this car, driven by Wilbur Shaw, has had its effect. Designed for road-racing its superior handling, road holding and comfort resulted in the adoption by American car designers of similar measures. The 1948 Indianapolis race saw a host of design refinements in the suspension systems, both front and rear. Independent front suspension, while becoming more widely prevalent each year, is not, however, favored by all designers. In fact, the peculiar requirements of the dirt track actually do not seem to favor the IFS. Five new Kurtis-Kraft cars, designed for utilization on both Indianapolis and the dirt track circuit, feature a suspension originally developed by Kurtis-Kraft for midget racers, and which utilizes torsion bars arranged longitudinally, with conventional axles located by radius rods.

In the rear, several more cars will use the De-Dion system this year, and, in fact, all the newer cars show efforts by the designer to achieve greater comfort combined with good roadability and stability.

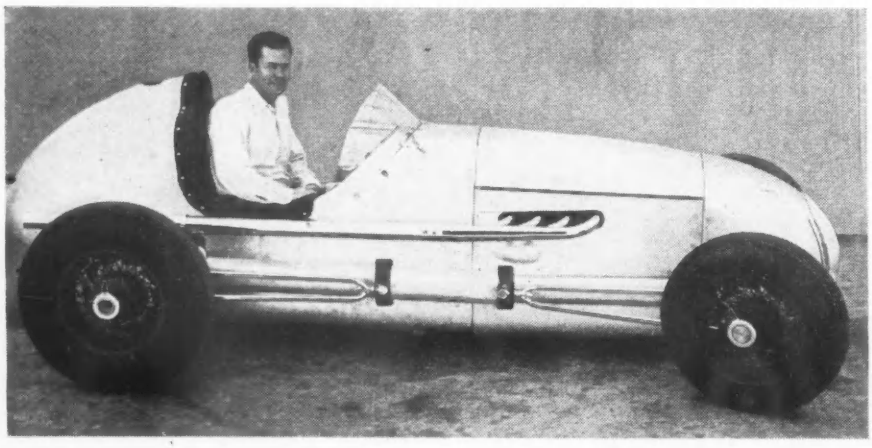
AAA regulations for Indianapolis now permit 96 in. minimum wheelbase instead of 100 in. This will permit the so-called "¾ cars", which were originally popular on dirt tracks, to run there for the first time this year. At least six cars entered have a 96 in. and a fraction wheelbase including the Kurtis-Kraft entry driven by Walt Brown. This car also has IFS by equal length arms, De Dion rear suspension, and torsion bars all around.

Next to improvements, or at least changes in suspension, probably the most interesting development in the newer cars is the adoption of the so-called quick-change rear end. Here again, this feature has been used on the midget race cars for some time. I believe there are at least 12 makes of such rear ends available for midget cars. The arrangement consists of placing the pinion shaft to the rear, with a countershaft running under the differential.

A pair of spur gears carried aft of the differential enclosure is readily accessible for quick changes of ratio to suit the particular conditions of track and surface. A second advantage is the lower seat position permissible with the lowered drive line. A point of interest is that while the midgets use a one piece axle shaft not enclosed, the larger cars have differential gearing, and separate axle shafts which are enclosed in the traditional manner. An exception is the new Lou Moore car, which is open.

Aside from suspension and rear axle design innovations, about the only other new development involves the use of aircraft type flexible, non-metallic fuel tanks, and many applications of aircraft fuel pumps, valves, fuel lines, and fittings. This should improve the reliability of these parts of the cars which has not been too good in the past.

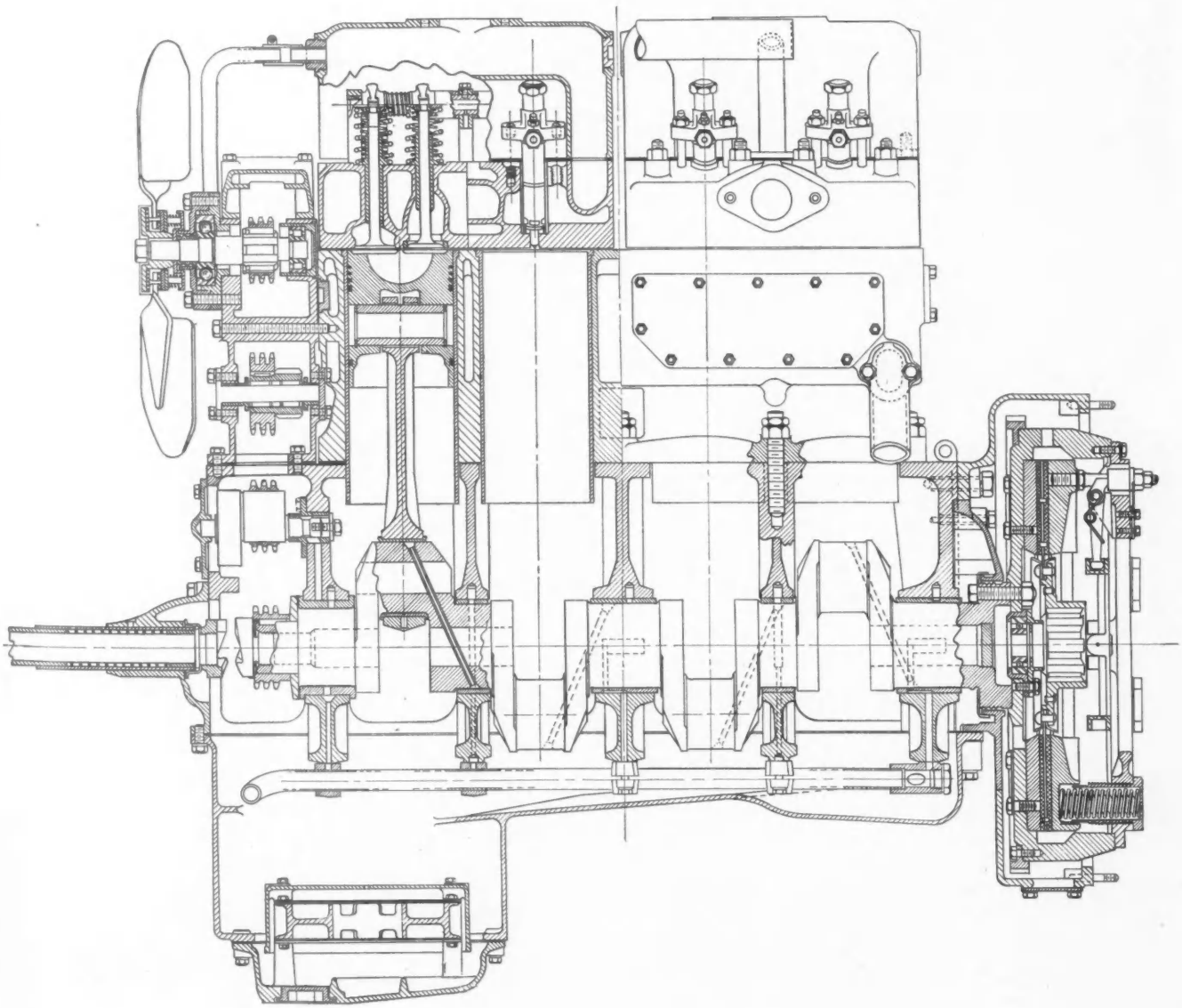
It is an amazing thing that despite a type of racing where engine design is the most important factor, the basic design of our engines has remained almost unchanged since the days of the late Harry Miller. It is also difficult to explain the continued popularity of the (*continued on page* 56)



Hal Cole in his City of Tacoma, the first of the 12 new Kurtis-Kraft racers of 96½ in. wheelbase designed for AAA racing at Indianapolis and on dirt tracks. It has a Meyers-Drake engine, a quick change rear end and torsion bar suspension all around.

Compact Diesel Engine Features Ease of Servicing

INTERESTING features of this four-cylinder fuel-injection Diesel engine, manufactured by Albion Motors, Ltd., England, are its compact size and ease of servicing. It has a displacement of 403 cu in., 4⅝ in. bore, six in. stroke, and develops 78 hp at governed speed of 1700 rpm. It is used on the British firm's truck chassis. Other features include a detachable cylinder head for each pair of cylinders, removable dry cylinder liners, removable inserts for exhaust valve seats, and decompressor plungers for the inlet valve rockers. This latter device, provided with a hand control, is used to relieve compression pressure for ease in turning over the engine by hand when servicing. A longitudinal sectional view of the engine is shown here.



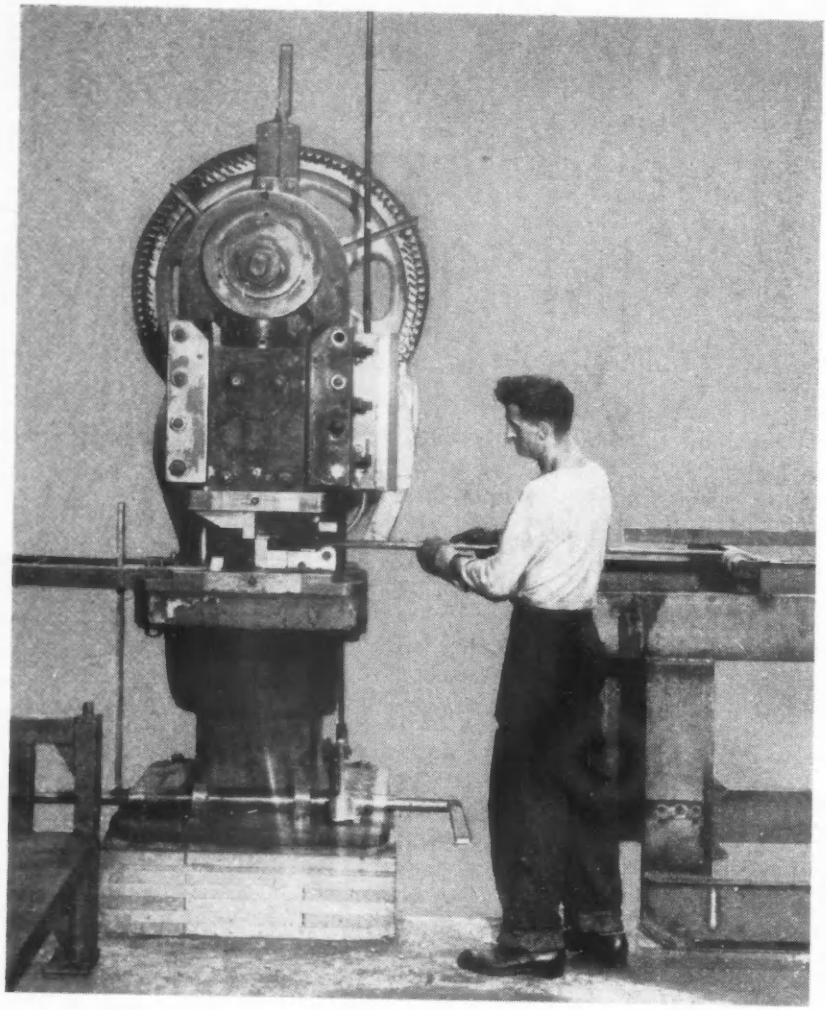


Fig. 1—First operation—shearing bars to length. Note the materials handling rack and foot controlled work ejector

New Self-Contained Line for Making Stabilizer Bars

THE Oldsmobile forge plant has placed in operation a compact and self-contained line for the fabrication of stabilizer bars. In the first operation, bars are sheared to length in the press shown in Fig. 1, the principal feature of the layout being provision of a materials handling rack at the right and the foot-operated stock ejector at the base of the press. Stock size is 23/32 in. round, 53½ in. long, weighing 5.14 lb.

The next major operation is the forging and upsetting of the ends in the heavy forging press, Fig. 2. In preparation for this, the bars are loaded into a special furnace at the left where they are heated to 2200F and automatically discharged by means of the flight conveyor at the exit end of the furnace. At this point the bars drop onto a portable conveyor where they are conveyed to a convenient position for the forging press operator. Immediately following this operation the upset end is hot-trimmed and pierced in an inclinable press. A feature of this set-up is a chute connecting the forging press and trim press to reduce materials handling.

The work is then ready for "stretching" in the special machine shown in Fig. 3. For this purpose

the bars are loaded onto a walking-beam conveyor which feeds the high-heat furnace at the extreme left where the work is held at 1600 F. The stretching machine is located at the exit end of this furnace to reduce handling. In the foreground in Fig. 3 is the chute that carries the "stretched" bars to the forming machine. The stretching operation is said to serve a number of useful functions, including: to assure parallelism of end boxes; to form the center section; and to assure uniformity of length of each bar.

The forming machine, Fig. 4, then bends the bars at each end, automatically, the parts being arranged to drop out of the fixture directly into an oil quench tank. Here they are picked up by a conveyor and transported to the draw furnace where the work is held to a temperature of 950-1050 F. At the discharge end of the draw furnace the bars are removed by the operator, gaged, and then racked for shipment to the assembly department.

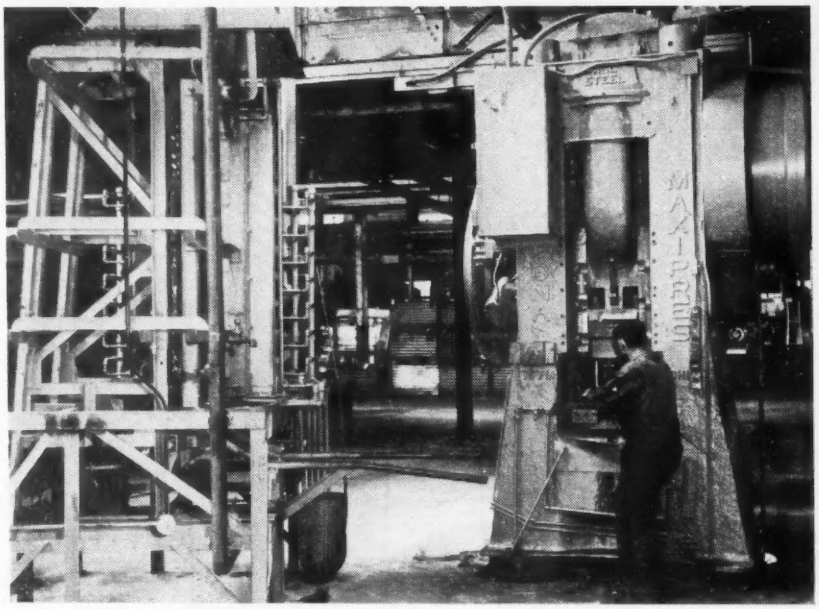
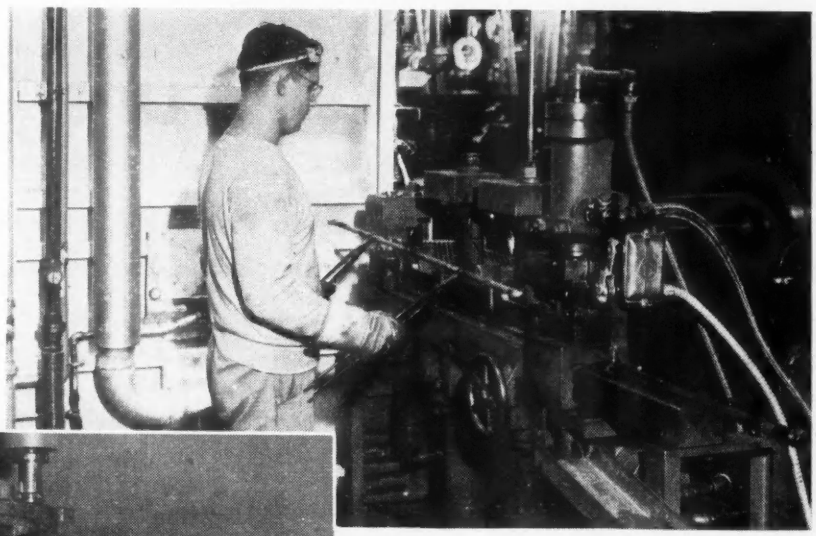


Fig. 2—Heavy forging press at the right forges and upsets ends of stabilizer bar. Heated bars for this operation come from the furnace at the left, being discharged on a portable conveyor where they are conveyed to press



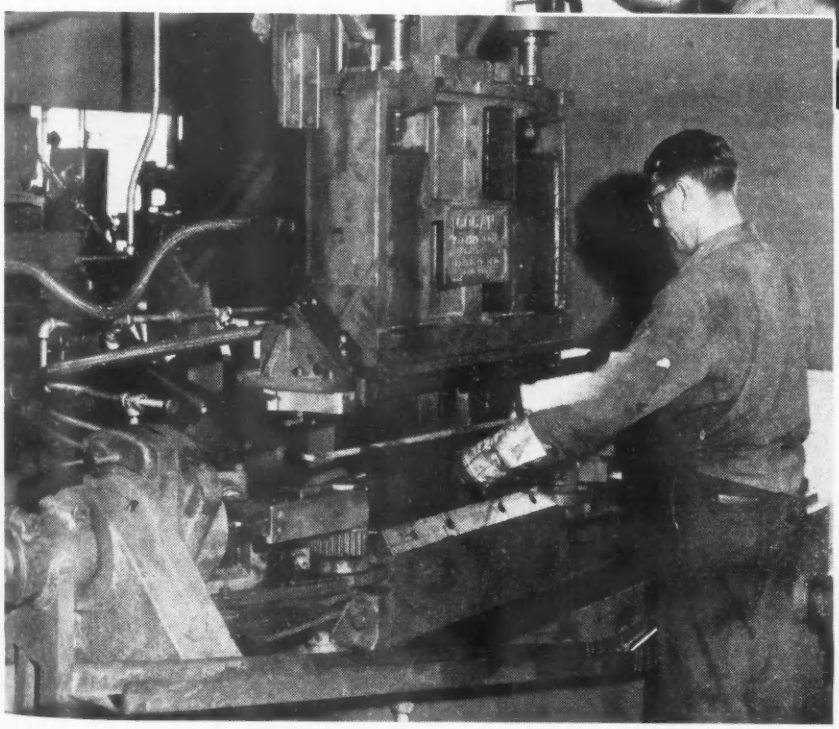


Fig. 3—(Above) This is a view of the special stretching machine that precedes the end forming operation. In preparation, bars are heated in the furnace at the left. Stretched bars then go to the forming machine via the chute shown at the right

Fig. 4—(Left) Last major operation is the form-bending of stabilizer bar ends in this machine

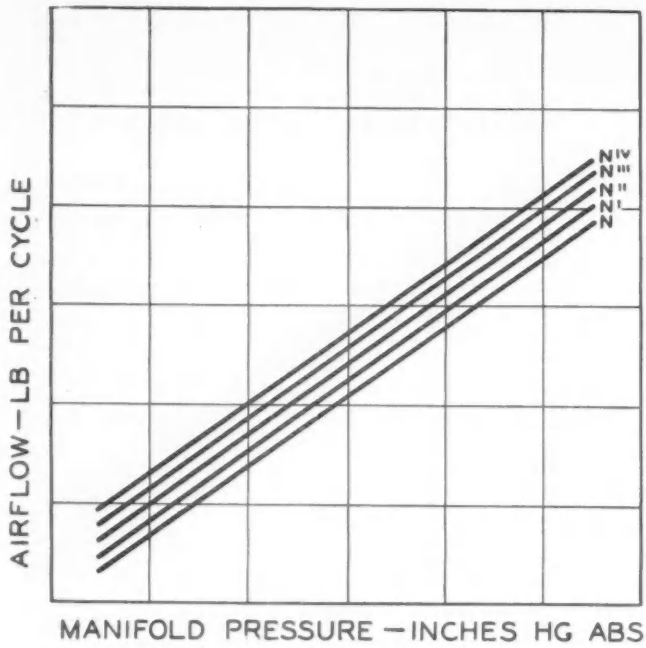


Fig. 1—Variation of airflow with manifold pressure.

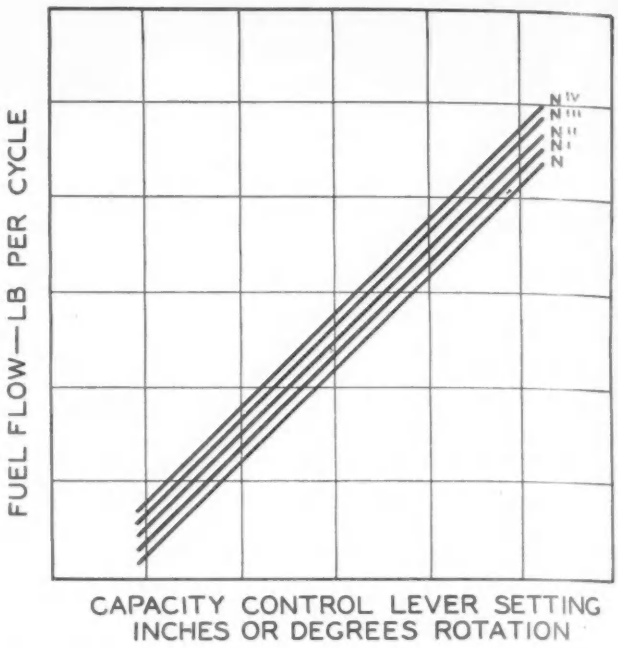


Fig. 2—Variation of fuel flow with capacity control lever setting.

Automatic Mixture Controls

Manifold Pressure Can Be Utilized to Provide Automatic Means of Regulating Fuel Delivery in Automobile Gasoline-Injection Engines

By Sidney J. Shames,
Project Engineer,
Fairchild Camera and Instrument Corp.

ALTHOUGH the application of fuel injection to gasoline engines has attracted attention for years, it is only recently that this development has been applied commercially in America. While these installations to date have been on aircraft power plants, current announcements indicate that automobile installations are forthcoming.

Since the application of any device on an automobile engine is dependent to a large degree on its cost, fuel injection equipment is at a disadvantage because of the relatively high cost of a fuel injection pump and its accompanying nozzles. In addition, some means must be provided to regulate the fuel in proportion to the air flowing into such an engine. Fortunately, however, the conventional fuel injection pump installation on a gasoline engine permits the attachment of a very simple manifold-pressure type of automatic mixture control.

Fuel Delivery Control

The conventional fuel-injection pump is of the variable volume type, and the device used to change the volume delivered consists of a lever, usually called the capacity control lever. This lever can be accurately calibrated at a given speed so that for various positions of the capacity control lever (C.C.L.), the pump will deliver different volumes of flow. Assuming changes in density of the fuel are negligible, calibration of the pumps show that at a given speed the C.C.L. will regulate the flow in pounds per cycle or stroke. Since a fuel injection pump is geared to the engine crank shaft and performs one pumping cycle for one engine cycle, if some means of knowing the air flow per cycle to the engine were available, this means could be linked to the C.C.L. and utilized to regulate the fuel delivery. Since tests have shown that at a given speed the intake manifold pressure is a very accurate indication of the air flow per cycle into the engine, the means of control is thus readily available. The resulting simplicity of such a system is apparent from the simple basis for its operation.

The effect of changes of engine speed on engine air flow is shown in Fig. 1. This figure includes the basic curve already discussed and additional curves obtained at other speeds. As shown, lines parallel to each other have been drawn to indicate air flow at the different speeds. While some engines may not produce exactly parallel curves, the accuracy of assuming parallel curves will be found to be well within

two per cent. Depending upon the valve timing and other engine breathing characteristics, it will be found that the charge per stroke at a given manifold pressure does not always increase with speed, but may reach a maximum at some speed and then fall off.

If the effects of engine speed on the delivery from a conventional fuel injection pump are considered, it is found, as shown in Fig. 2, that curves parallel to the basic curve previously mentioned are obtained at different speeds. Normally in these pumps, the delivery per stroke at a constant C.C.L. setting increases with speed, and as a result these pumps are said to have a rising speed-delivery characteristic. However, by suitable modification of the pump delivery-valve and selection of injection valves, declining, rising or combined characteristics can be obtained. The problem is to match this characteristic with the engine airflow per cycle-speed characteristic so that proper compensation results.

If a control composed of a pressure measuring device designed to move in accordance with manifold pressure is connected to the capacity control lever, a constant fuel-air ratio for all operating conditions would result. For conditions where enrichment is desired, it is merely necessary to arrange the pressure measuring system so that its displacement increases at the conditions where enrichment is desired. Such a system has advantages over the enrichment method of a conventional carburetor, since enrichment in this case is a function of manifold pressure or charge density. The advantage is that enrichment would be more in line with the engine's requirements, since it is provided to eliminate knocking which is a function of the charge density and not the rate of charge taken into the engine. This will help reduce fuel consumption at conditions where, in a conventional carburetor, fuel would be wasted, such as at high speed and low manifold pressure operation. No account has been taken of changes in air temperature or exhaust back pressure, the two remaining variables that influence charge density. In automobile applications these variables do not change to a large extent, and thus the carburetor in use today does not include any mechanism to account for such changes.

Control Design

In order to construct an actual control, it is necessary to know the total motion of the C.C.L. of the fuel injection pump and the force necessary to move this lever. The latter should be determined under cold conditions. It is recommended that the pump plungers be designed so that they are hydraulically balanced; that is, the pumping forces need not be overcome to move the C.C.L. Also the linkage and levers moving the capacity control lever should incorporate anti-friction bearings wherever possible. The smaller the force necessary to move the C.C.L. the smaller the pressure sensing unit required and the greater the accuracy of the control. It is, of course, possible to install a servo (gasoline, oil or electric) system between the sensing unit and the C.C.L., but in view of its cost, it is recommended that such systems be avoided.

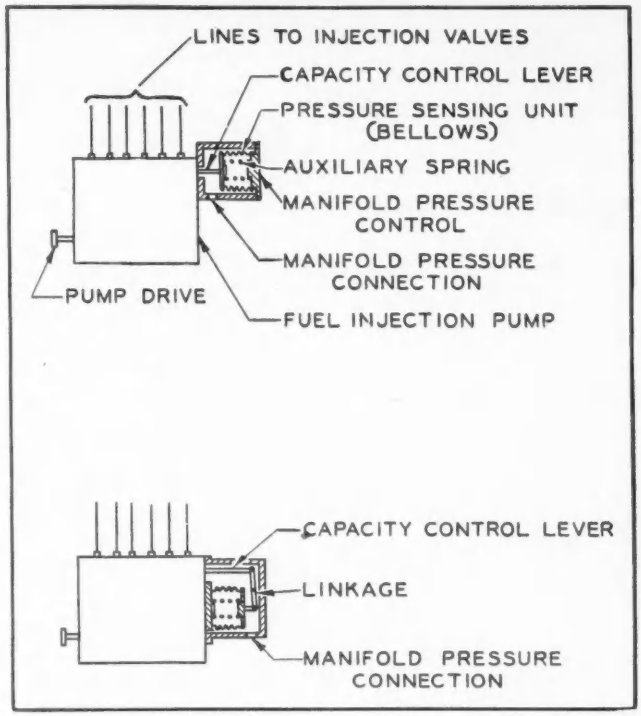


Fig. 3—These drawings show elements of two manifold-pressure type automatic mixture controls. The systems use a sealed metallic bellows, and thus are sensitive to absolute manifold pressure.

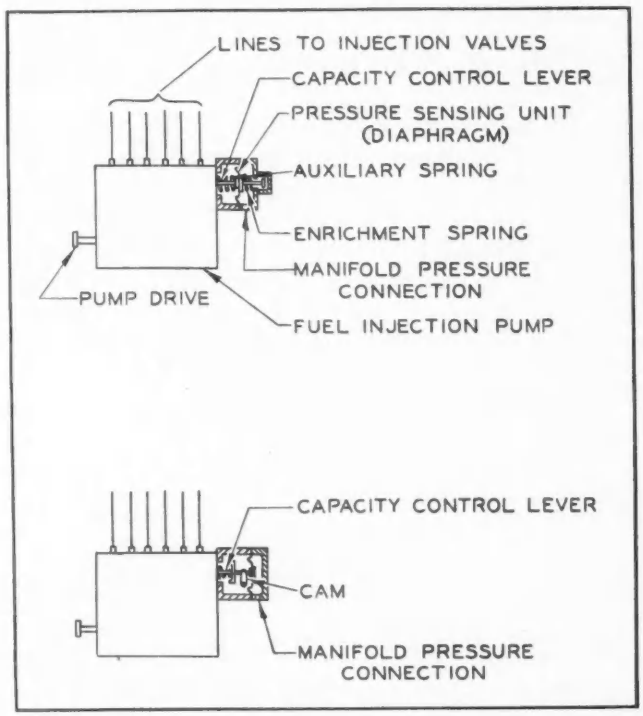


Fig. 4—These drawings illustrate how the manifold-pressure type automatic mixture controls can be made sensitive to the difference between manifold pressure and atmospheric pressure through the use of a non-metallic diaphragm.

Configurations such as shown in Figs. 3 and 4 can be used. The choice is dependent upon the capacity control lever stroke and (*Turn to Page 54, please*)

Carbide-Tipped All-Depth Have Wide Range of

DUE to their shape—resembling the drills used for drilling gun barrels — "all-depth" carbide drills have been generally referred to as "gun" drills. It is true that many of them have been used for this purpose, but neither "gun drilling" nor "deep hole" drilling describes adequately the broad potential uses for these carbide tipped drills.

In general, all-depth carbide drills are being used because they provide a means of obtaining exceptionally high production rates in drilling all manner of holes in metals, and also give longer drill life between grinds as compared with steel drills. Use of these carbide drills is not confined to deep holes. The drills perform even better, comparatively, on shallow holes—where a chip problem may develop if a twist drill is used. Compared with high speed steel drills, feed rates on these carbide drills can easily be doubled.

With carbide drills, larger holes may be drilled at once from the solid instead of removing material by several successive drilling operations. Holes can also be drilled closer to the desired size because of the increased accuracy obtained when using carbide drills. In other words—the carbide tipped all-depth drill promises to have a much broader field than it has today.

Table I—Drill Sizes Ordinarily Made to Solid Carbide Design (See Fig. 1)

Table II—Drill Sizes Made to Brazed Type Wear Strip Design (See Fig. 2)

Table III—Drill Sizes Made to Detachable Wear Strip Design (See Fig. 3)

Drill Types

Carbide tipped all-depth drills may be divided into two general types: (1) The "solid carbide" type (see Fig. 1) and (2) The "wear strip" types (see Figs. 2 and 3).

Table I lists the drill sizes which are ordinarily made to the solid carbide design. This type has the entire drill end made from solid carbide. The ends are copper brazed to a steel body or shank. The steel shank is made sufficiently long so that the heat resulting from the low temperature brazing operation—i.e., when attaching the drill end to the drill tube—will not weaken the copper braze joint.

The wear strip type of drill (shown in Figs. 2 and 3) is made with one carbide cutting tip and two carbide wear strips. One wear strip is located 90 deg behind the cutting edge, and the other wear strip is located 183 deg behind the cutting edge.

The brazed type wear strip drills are shown in Fig. 2 and listed in Table II. For these, the same size drill tubes can be used as for the solid carbide type and the tips can

TABLE I

Diameter D	Length Carbide L	Overall Length E
¼	¾	1 11/16
.2905 30 cal.	1 3/16	1 13/16
5/16	⅞	1 7/8
⅜	1	2 1/16
7/16	1 1/8	2 1/4
.487 50 cal.	1 5/16	2 1/2
½	1 5/16	2 1/2
9/16	1 3/8	2 5/16
⅝	1 9/16	2 5/8

TABLE II

Diameter D	Overall Length E	Carbide Cutting Blank T	Carbide Cutting Blank L	Carbide Wear Strips F	Carbide Wear Strips G	Carbide Wear Strips H
.2905 30 cal.	1 13/16	3/64	5/8	1/32	3/64	¾
5/16	1 7/8	3/64	5/8	1/32	3/64	¾
⅜	2 1/16	1/16	1 1/16	1/32	3/64	¾
7/16	2 1/4	1/16	1 1/16	1/32	3/64	¾
.487 50 cal.	2 1/2	3/32	⅞	3/64	1/8	1
½	2 1/2	3/32	⅞	3/64	1/8	1
9/16	2 5/16	3/32	1 3/16	3/64	3/16	1 1/8
⅝	2 5/8	3/32	1	3/64	3/16	1 1/8
11/16	2 11/16	3/32	1 1/16	1/16	1/4	1 1/4
¾	2 ¾	1/8	1 1/8	1/16	1/4	1 3/8
.760 20 mm.	2 ¾	1/8	1 1/8	1/16	1/4	1 3/8
13/16	2 13/16	1/8	1 1/8	1/16	1/4	1 3/8
⅞	2 7/8	1/8	1 1/4	3/32	5/16	1 7/16
15/16	3	1/8	1 1/4	3/32	5/16	1 7/16
1	3 1/16	3/32	1 7/16	3/32	3/8	1 5/8

TABLE III

Diameter D	Length B	Shank Diam. A	Shank Length C	Overall Length E	Carbide Cutting Blank Thickness T	Carbide Cutting Blank Length L	Carbide Wear Strip Thickness F	Carbide Wear Strip Width G	Carbide Wear Strip Length H
1 —1 7/64	2 3/8	5/8	1 1/8	3 1/2	3/32	1 7/16	3/32	3/8	1 5/8
1 1/8—1 15/64	2 1/2	1 1/16	1 1/8	3 3/8	3/32	1 7/16	1/8	3/8	1 3/4
1 1/4—1 23/64	2 11/16	¾	1 1/4	3 15/16	3/32	1 7/16	1/8	7/16	1 7/8
1 3/8—1 31/64	2 13/16	⅞	1 1/4	4 1/16	3/32	1 7/16	3/32	7/16	2
1 1/2—1 39/64	3 1/16	1 5/16	1 1/4	4 5/16	3/16	1 11/16	3/32	1/2	2 1/16
1 5/8—1 47/64	3 3/16	1	1 1/4	4 7/16	3/16	1 11/16	3/32	1/2	2 3/16
1 3/4—1 55/64	3 3/8	1 1/8	1 1/4	4 5/8	3/16	1 11/16	3/32	1/2	2 5/16
1 7/8—1 63/64	3 5/16	1 3/16	1 1/4	4 13/16	3/16	1 11/16	3/16	9/16	2 7/16
2 —2 7/64	3 5/8	1 1/4	1 3/4	5 3/8	7/32	1 15/16	3/16	9/16	2 1/2
2 1/8—2 15/64	3 7/8	1 5/16	1 3/4	5 5/8	7/32	1 15/16	3/16	9/16	2 5/8
2 1/4—2 23/64	4	1 3/8	1 3/4	5 3/4	7/32	1 15/16	7/32	5/8	2 3/4
2 3/8—2 31/64	4 3/16	1 1/2	1 3/4	5 15/16	7/32	1 15/16	7/32	11/16	2 7/8
2 1/2—2 39/64	4 1/4	1 1/2	1 3/4	6	1/4	2 3/16	1/4	11/16	2 15/16
2 5/8—2 47/64	4 7/16	1 5/8	1 3/4	6 3/16	1/4	2 3/16	1/4	¾	3 1/16

Drills Applications

By Fred W. Lucht,
Development Engineer,
Carboloy Company

be attached with the same brazing method.

The wear strip type drill shown in Fig. 3 and Table III has the advantage of easier handling, particularly during drill sharpening, since the drill end is detachable. The shank end of this type of drill —known as the "wear-strip-detachable" type—is an adaptation to drill bars as furnished by Pratt and Whitney Co.

Grades of Carbide

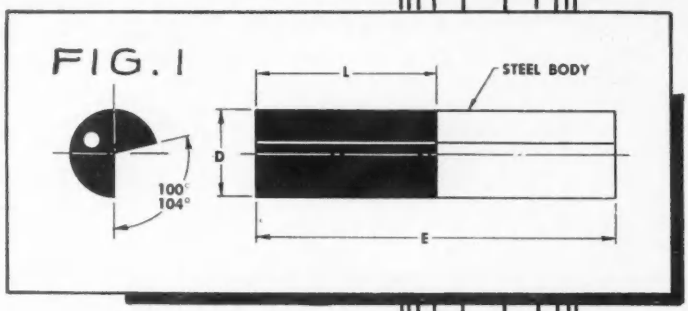
For the solid carbide type of drill, as well as for the cutting tip and the wear strips for the wear strip type of drill, a straight tungsten grade of carbide will work satisfactorily on various kinds of steels and many other materials. If the operating conditions warrant it, an even more wear resistant grade—similar to Carboloy Grade 883—can be used.

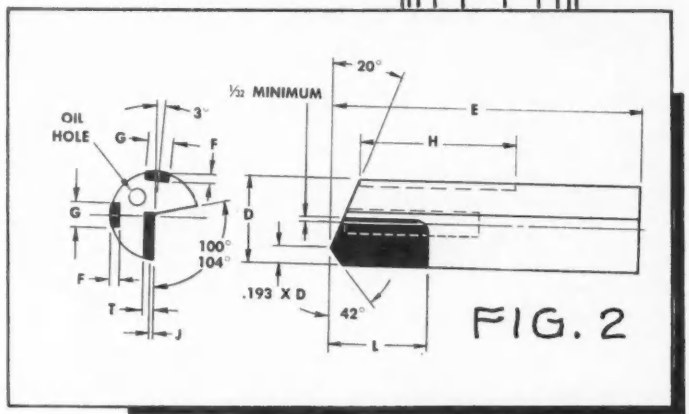
Machines

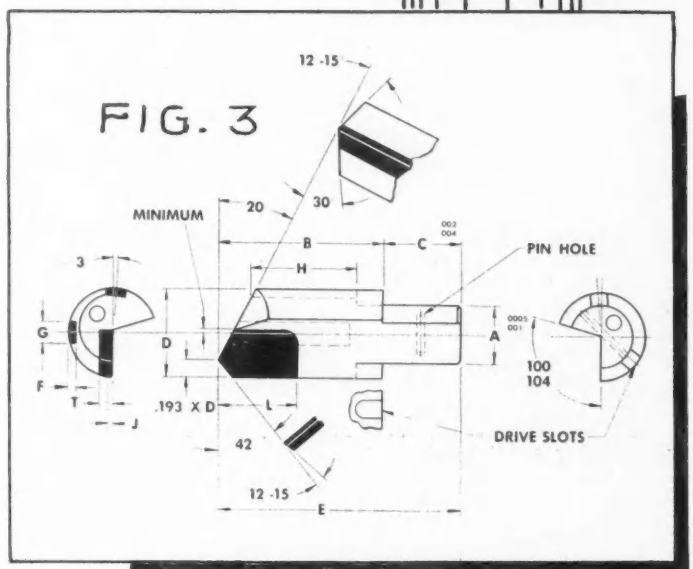
Best results are obtained at present with carbide all-depth drills when used on regular "gun drilling" machines designed for the use of stationary type drills. However, a pressure gage should be attached to the drill-feeding slide to determine whether the oil pressure is high enough to maintain a uniform rate of chip flow.

The all-depth drill is self guiding in the work. Its usual tendency is to follow the general direction in which it has been started. Therefore, the drill guide bushing in the combination drill-guide-and-work-support is one of the most important parts of a drill set-up. The bushing should be hardened and ground, and should run in an anti-friction bear-

(Continued on page 82)







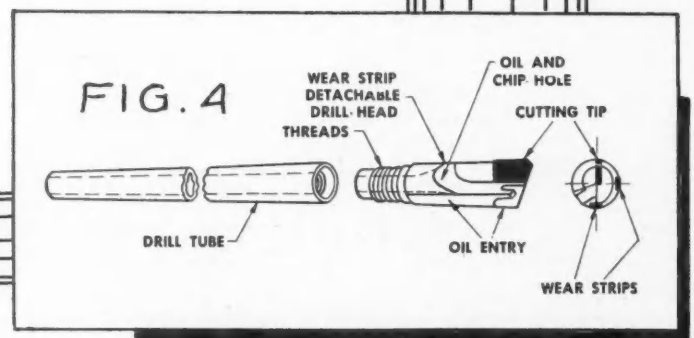


Fig. 1—Solid carbide type

Fig. 2—Wear strip—brazed type

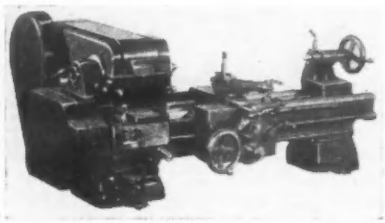
Fig. 3—Wear strip—detachable type

NEW Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 60

J-99—Precision Bench Lathe

Sheldon Machine Co., Chicago, is introducing a new 10-in. bench lathe with a 1-1/16-in. hole through the spindle and an integral horizontal motor drive. This lathe gives Sheldon a new lower priced machine to add to its line of 10 in., 11 in., and 12 in., lathes. It has ¾ in. collet capacity (1 in. collet capacity with nose type collet chuck), tapered-roller spindle bearings, double-walled worm feed apron with power cross feed, full quick-change gear box that gives a thread cutting range of from four to 224 threads per inch. The four-step, V-belt motor drive is designed to take either a 1/3 hp or ½ hp motor.



Sheldon 10-in. lathe

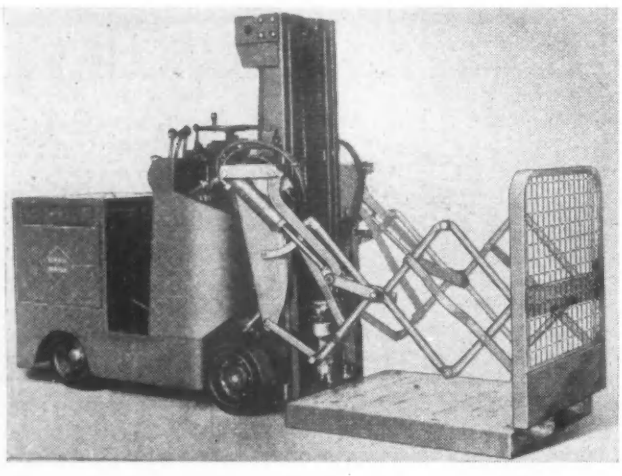
J-100—Pallet Retriever for Fork Trucks

One of the latest developments of Elwell-Parker Electric Co., Cleveland, Ohio, is a pallet retriever attached to a standard fork-type truck whereby pallets may be used in the customary method for fast loading of freight cars, yet remain at home in owner's possession. With this attachment the truck owner is said to have practically all the advantages of the truck-pallet method in his own plant and also in loading cars, without loss.

The accessory is light, compact and attachable to the forward end of the truck. A load-handling or stabilizing mechanism consists of two hydraulically actuated pantograph-type rams which terminate in a screen frame that remains in fixed position with respect to the load.

Rams are self-adjusting to fit and follow the contour and vertical or lateral motion of the load, while the truck with the pallet backs away and withdraws the pallet from beneath the load. The rams can be operated in corners of box cars since they may be actuated independently or together.

No part of the mechanism at any height of lift projects across the entrance to or exit from the driver's station.



Elwell-Parker pallet truck retriever

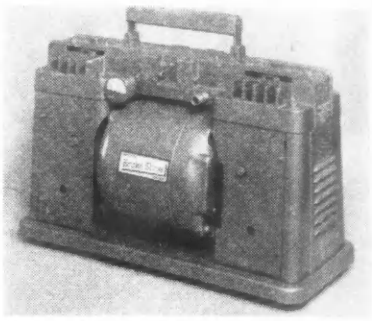
J-101—Portable Air Compressors

Two portable, fractional-horsepower air compressors are being delivered by American Brake Shoe Company's Kellogg Division, New York. Both models are said to produce 100 per cent oil-free air. Special designing eliminates all contact or contamination of the air with lubricating oil. Both compressors are readily adjustable for different pressures.

Model 17-C delivers 4.4 cfm free air at 40 psi. It is powered with a ½-hp electric motor. New "lubricated for life" sealed ball bearings eliminate the necessity of oiling. The entire mechanism is encased in welded steel frames. This model has twin air cleaners which are quickly accessible by loosening only two cover screws.

Model 8-C delivers 2.2 cfm at 25 psi. It is powered with a ¼-hp electric motor. Equipped with a single air cleaner, this model has no cylinders, pistons or rings. A force feed oil system provides positive lubrication. The unit is mounted on a steel base with rubber feet.

Both compressors are said to be particularly adaptable for low-pressure high-volume work.



Model 17-C Kellogg air compressor

J-102—Automatic Internal Grinder

An automatic internal grinder, the No. 216, is the latest addition to the line of the Bryant Chucking Grinder Co., Springfield, Vt. The machine is provided with a 16-in. swing inside the standard water guard and with a 15 in. total wheel slide traverse. The swing is limited to 12 in. when grinding tapers greater than 15 deg included angle. It is generally suited for grinding work with bores up to eight in. diameter and the grinding traverse permits grinding of six in. bore lengths. For the smaller ranges of bores, Bryant high frequency wheel spindles operating up to 100,000 rpm may be used. A variety of standard or special tooling may be used in conjunction with the machine.

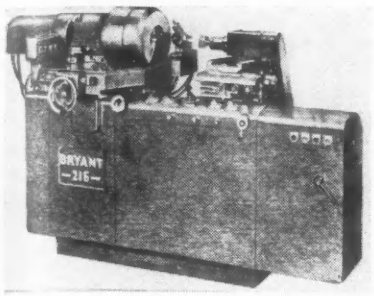
The cross feed is obtained by lateral motion of the work table which is supported by roller bearings.

The various movements of the machine are hydraulically operated. Cycle control is accomplished electrically so that the cycle can be readily changed to suit varying working requirements.

Three methods of automatic sizing are provided for this machine. The basic machine is equipped so that change-over from one method to either of the others can be accomplished by the addition of the sizing equipment.

Sizing from the diamond is accomplished by grinding a predetermined amount beyond the wheel truing position. Automatic plug sizing is accomplished by a plug gage, mounted in the work spindle, which automatically checks the bore size after each pass of the grinding wheel. A third meth-

od of sizing can be applied wherein a diamond tipped finger, contacting the bore as it is being ground, operates electrical contacts at the proper time to arrest the grinding action



Bryant No. 216 hydraulic internal grinder

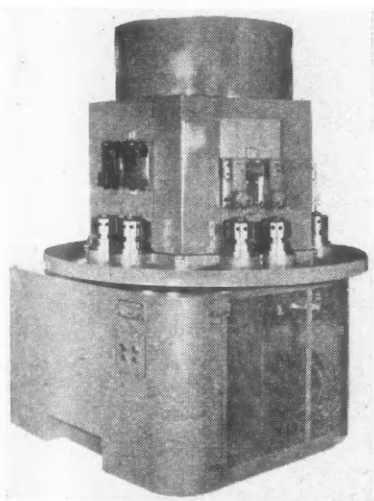
of the machine, withdrawing the wheel from the bore.

For taper grinding the wheelhead is swung about a center directly under the chuck. Tapers can be ground up to 60 deg included angle.

J-103—Precision Boring Machine

A standard high-production precision boring machine, designed specifically for the use of the solid cemented carbide boring bars which were recently devoloped by Carboloy Co., Inc., has been placed on the market by Hoern and Dilts, Inc., Saginaw, Mich. The new Model 10-5 is a five-station, ten-spindle machine with a Carboloy boring bar for each work spindle. Standard carbide boring bits are inserted in each carbide boring bar.

The head of the machine is pentagonal, each side carrying two boring bars. In operation, the head and



Hoern and Dilts Model 10-5 boring machine

work table revolve continuously. Work spindles stop turning and the boring bars retract at the loading station. The spindles again start

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For additional information regarding any of these items, please use coupon on page 60

automatically when the loading station has been passed.

Chief advantage of the Carboloy boring bars is their ability to bore parts of greater lengths-to-diameter ratios with accuracy. This is possible because high rigidity of the carbide bar reduces both deflection and 'wind-up'.

Spindle and work table speeds are changed by means of interchangeable V-belt pulleys in the drive from the main 10-hp, 1800 rpm spindle drive and the 2-hp table drive motors.

Capacity of work for the Hoern and Dilts Model 10-5 is six in. maximum OD and ¼ in. minimum ID. Maximum boring depth on the standard machine is 5 in.

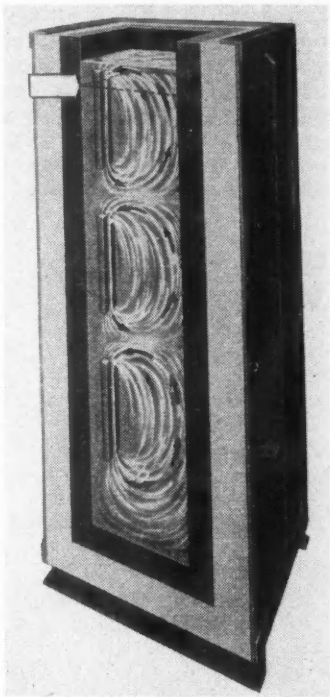
J-104—Furnace for Long Work Pieces

The Ajax Electric Co., Philadelphia, Pa., offers a new design of the Ajax Hultgren electric salt bath furnace for heat treating in the temperature range of 300 F to 2400 F, which permits the work to be hung vertically. The vertical loading is claimed to assure control over distortion, simplify the fixtures and work-holding devices, and greatly reduce the floor space requirements. These Ajax furnaces are similar to the standard Ajax units except that the electrodes are inserted through the side walls and are completely immersed in the bath.

In the event that the salt should freeze because of power interruption, control equipment failure, or any other reason, no damage is done. Shrinkage of the salt due to freezing drops the level of the bath so that the electrodes are exposed a few inches above the surface of the solidified salt and the bath can be restarted by melting a small salt area between the closely-spaced electrodes.

For deep furnaces, several pairs of electrodes are cascaded, one above the other. In restarting, the top pair melts the salt within its zone and presents molten salt to the electrodes directly beneath and so on down to the bottom of the bath. Because melting of a solidified bath is from top to bottom, there is no danger of creating sealed-in pressure at the bottom while the top is still frozen, according to Ajax.

Heating current is confined to the narrow gap between the closely-spaced electrodes. Thus, the full



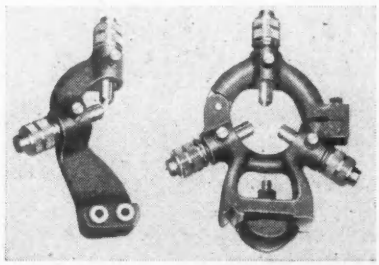
Cross section of Ajax Hultgren salt bath furnace. Arrow at top shows level of salt when frozen

depth of the furnace may be used without danger of current entering the work to cause overheated zones or premature pot failure due to hot spots.

The Ajax submerged electrode design permits use of a complete steel outer casing, which prevents any salt leakages.

J-105—Improved Work Supports

A De Luxe type follower rest and center rest have been developed by the South Bend Lathe Works, 119 E. Madison St., South Bend 22, Ind. Principal features of both the follower rest and center rest are the wrenchless adjustment and locking



South Bend De Luxe work supports

of the jaws. Each jaw has a large knurled knob for adjusting the jaw position, and a thumb screw for locking. A double-acting compound screw thread provides approximately 3/16 in. jaw movement for each revolution of the adjusting knob. Smooth action, with just enough resistance to hold the jaw securely in position until it is locked with the thumb screw, is said to permit quick adjustment with extreme precision.

The jaws are made of brass and slide through precision steel sleeves which are pressed into the supporting frame. Both the follower rest and center rest are available for current models of South Bend lathes.

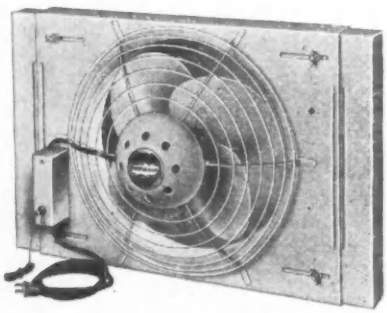
NEW Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 60

J-106—Adjustable Window Fans

A line of adjustable window fans in sizes of 12 in., 16 in. and 20 in. fan diameter, is a recent development of the Schwitzer-Cummins Co., Indianapolis 7, Ind. The over-all dimensions of the assemblies are 15 in., 20 in. and 24 in. square.

All three sizes are three-speed with



Schwitzer-Cummins window fan

high delivery and an outstanding feature is said to be the quiet operation of the fan at all speeds. Air deliveries at first and third speed are 1250 cfm and 450 cfm for the 12-in. fan, 1600 cfm and 650 cfm for the 16-in. fan, and 2500 cfm and 1100 cfm for the 20-in. fan.

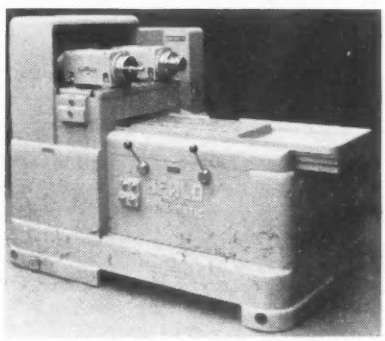
All fans are direct driven and come complete with a pull cord to operate the speed control, inside and outside guards (optional), and a motor lead cord and plug. Each model is adjustable to a wide range of window frames commensurate with the air delivery of the fan.

J-107—New Heald Boring Machines

The Heald Machine Co., Worcester 6, Mass., has augmented its line of Bore-Matics with two new models, the 421 and 422. They fill a demand for large standard machines to handle heavy work without the necessity for special out-size equipment. Like all Heald Bore-Matics, these machines are capable of performing boring, turning, chamfering, grooving, facing or fly-cutting operations separately or in any desired combinations.

The machines are said to combine speed with versatility despite their massive construction and capacities. The single end Model 421 and its companion machine, the double end Model 422, are ideal for mass production of a single part requiring several operations, or for single or multiple operations on several parts simultaneously, according to the manufacturer.

Highly productive cycles are obtained through increased tempo of



Model 421 Heald Bore-Matic

all cycle elements, including table traverse speeds, boringhead speeds, starting and stopping of heads. Up to ten hp is available at each end of the machine, providing maximum power for heavy roughing cuts and higher speeds when using multiple heads. Boringheads, grease lubricated at the factory, require no attention. From one to four individual boringheads or a special multi-spindle head unit can be installed on each bridge, providing a wide range of application possibilities.

Uniform hydraulic feeds remain constant throughout the day regardless of oil temperature changes, maintaining definite production, finish and accuracy. Additionally, fast automatic cycles maintain efficient table and boringhead action, it is stated.

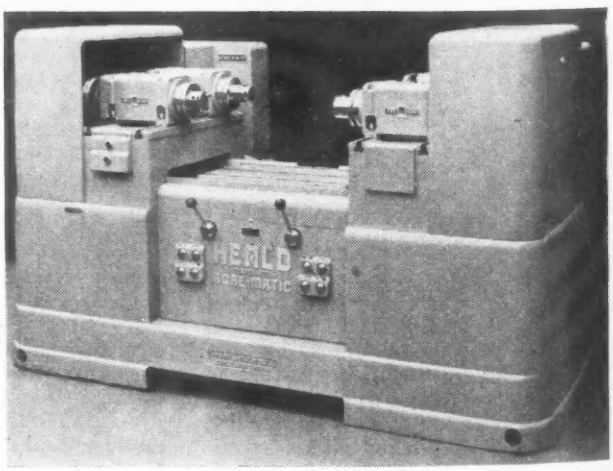
Provision has been made on the main control panel for installation of units for operation of hydraulic fixtures, cross slides, chucks, etc. Simple control settings permit different rates of "in" and "out" feeds when two way boring is required. Only one design of tools is necessary for the double end machine—all rotating tools having the same hand.

J-108—Fixture for Grinding Chasers

Landis Machine Co., Waynesboro, Pa., has brought out a chaser grinding fixture, the No. 15, for grinding Landis chasers. It is intended that this fixture should be used to grind, on the tangential chaser, the compound rake and lead angles which are essential to the production of accurate, well-formed threads.

Supported by the base casting is a crossarm, arranged so that the chaser platen can be adjusted vertically. This feature makes possible the grinding of any desired rake angle. The platen can be rotated throughout a 360 deg circle horizontally, thus providing an accurate means of producing the desired lead angle. Knurled knobs, which have pin holes for added leverage, securely hold the fixture in the position to which it is set.

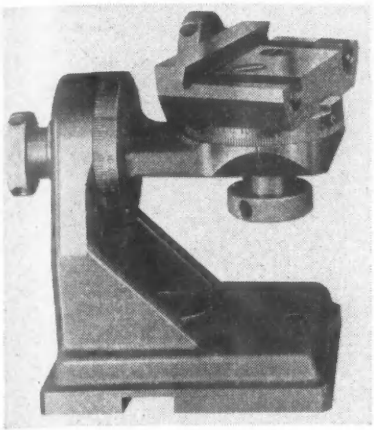
The new fixture can be adapted for use on any grinding machine which has a traversing table, regardless of



Model 422 Heald Bore-Matic

the type grinding wheel it uses. The base of the fixture is made so that it can be clamped to a T-slotted table or on a magnetic chuck.

This fixture can be successfully

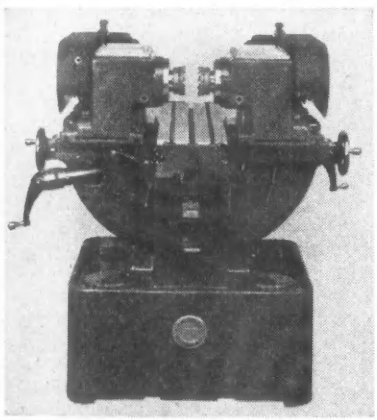


Landis No. 15 grinding attachment

used on all Landis chasers up to 1¼ in. wide. It measures 3¼ in. square at the base, and 3 15/16 in. in overall height.

J-109—Double Spindle Milling Machine

The W. H. Nichols Co., Waltham, Mass., announces the new Nichols Twin Miller, a double-spindle, high-precision machine. It is claimed to



Nichols Twin Miller

be particularly valuable for light-duty work where two surfaces can be milled in a single pass. The machine has two opposed, geared milling heads, powered by pancake type motors, and each has available 15 spindle speeds from 55 to 2080 rpm.

Each milling head is adjustable in three planes: horizontally by means of slides and set screws; vertically; and transversely by feed screws with direct-reading micrometer dials. The maximum height of spindle centerline above table is 12 in., minimum height is 1½ in. The maximum distance between spindle noses across table is 16 in., the minimum distance is four in. Vertical attachments, which may

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For additional information regarding any of these items, please use coupon on page 60

be fitted to either spindle, provide additional flexibility. The 8½-in. by 34-in. table is pneumatically powered by a solenoid-operated air cylinder and travels a maximum of 12 in., with a 9-in. hydraulically-controlled cutting stroke. The machine requires 4 ft by 5 ft floor space and is 55 in. in height.

J-110—Six Station Special Machine

Drilling, boring, reaming, counterboring and tapping operations on automobile front wheel spindle supports are performed on a new six-station multi-operation machine manufactured by Baker Bros., Inc., Toledo, Ohio.

The machine is equipped with an automatic power indexing trunnion for transferring the parts from the loading station through the five machining stations. Location at each of the indexing stations is provided first by a shot pin, and then positive location by guide bars that move in with the right and left head units. Clamping and unclamping of one right and one left hand part at each station is accomplished through use of a separate hydraulically operated clamping unit.

Components of the machine include two standard Baker model 3½ in. by 24 in. floor type hydraulic feed units, located to the right and left of the indexing trunnion. These units have saddles mounted on round 3½ in. diameter nitralloy bars. Saddles travel on X-alloy bushings, and carry master driver boxes for pot-head installation of multiple spindles.

Master driver boxes are mounted on standard model 3½ in. by 24 in. drive brackets having drive through V-belts and pick-off speed change gearing to master driver box and spindles. Spindles are mounted on ball bearings and driven through hardened gearing mounted on hardened steel shafts. Gear boxes and multiple heads are arranged with self-contained lubricant pumps for cascade lubrication.

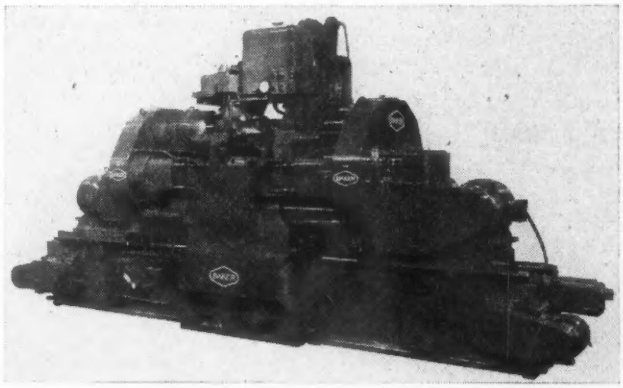
An auxiliary model 3 by 12 hydraulic feed unit equipped with a four-spindle head, and an auxiliary four-spindle tapping unit, are mounted to the rear of the trunnion for tap drilling and tapping four small cross holes. The tap unit is mounted on a feeding saddle with an air cylinder, for rapid advance and return, allowing the unit to clear the trunnion for indexing. Hydraulic feed power for the auxiliary 3 by 12 is supplied by the new type Baker hydraulic power pack located outside the machine base.

J-111—Light Weight Electric Tractor

The Mercury Manufacturing Co., Chicago 9, has just put into production a light-weight electric tractor to meet moderate industrial haulage requirements, i.e., those where trailing loads are not too severe, operating conditions are reasonably good, and floor and elevator capacities as well as operating space are limited.

Designated as Model A-560-5, this new tractor is only 70 in. long, exclusive of coupler, and 34 in. in width. The weight of the chassis without power source is 1450 lb. Light running speed is 6.5 mph. Normal drawbar pull rating is 200 lb with maximum drawbar pull established at 1,000 lb which is claimed to be sufficient to move a trailing load of 25 tons on smooth, level surfaces.

The standard power source for this chassis is a low type, 36-volt battery of 300 amp-hr capacity.



Baker multi - operation machine

K-109—Balancer for Portable Tools

A new balancer, for suspending portable tools in shop or production line work, is offered by the Aro Equipment Corp., Bryan, Ohio. The new Model 7072 balancer can be adjusted for correct balance on all types of portable tools weighing up to 10 lb.

The balancer is designed to provide in-line suspension of tools. The cable comes out of the bottom of balancer, in line with the suspension eye. This eliminates twisting or turning of balancer.

Strong, light-weight construction of the unit is said to be achieved with an all-steel stamped housing

Aro balancer for suspending portable tools

and drum. The balancer can be adjusted by moving a spring trigger, located on the shaft, to lower the tension. To increase tension, the shaft is wound clockwise with an open end wrench. Worn cables can be replaced by inserting a new cable through bottom opening into drum and rewinding. It is not necessary to disassemble the balancer.

Standard equipment includes six ft of preformed wire cable, rubber bumper and cable clamp for adjustments at any level.

K-110—Check Valves for Vacuum Brakes

New spring loaded check valves for use in tractor, truck and trailer vacuum power brake installations are announced by the Bendix Products Division, Bendix Aviation Corp., South Bend, Ind. The valves are housed in a new one piece body with

NEW ★ PRODUCTS

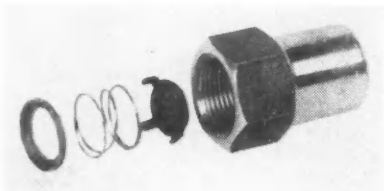
For additional information regarding any of these items, please use coupon on page 60

only three inner parts; a poppet valve, spring, and retainer ring. The difference in the two valves is determined by where the spring is placed to influence the poppet.

The UVC check valve is used in the vacuum line on the tractor or truck. It will operate in any position and being spring loaded in the closed position, it is not affected by vibration or rough roads.

The UTC valve is an emergency valve for use on trailer vacuum power brake installations. It is held in the open position in normal operation by a spring. This valve operates only when the line is suddenly opened as in a trailer break-away.

According to the manufacturer's instructions, the UTC emergency check valve should preferably be used



Exploded view of the Bendix UVC check valves. Left to right: Retainer ring, spring, poppet and one piece valve body.

with hose lines of at least ¾-in. diameter (½-in. pipe). This insures full effectiveness of the valve.

Advantages claimed for the new valves are: A more positive seal, with longer life; a one-piece housing with only two moving parts; universal mounting; lower cost and easy replacement of all earlier types.

K-111—New Products of U. S. Rubber Co.

A new type of floor covering for automobiles that can be formed in one piece, if necessary, and used without binding, is a recent development of the United States Rubber Co., New York. The new material, known as Velvomat, is used also for bus and airplane floor covering.

Velvomat can be swept, vacuum cleaned or washed. In its manufacture, a luxurious-looking pile is built up of burlap, fabric or rubber. The pile can be varied in thickness, weight and pattern. It can be produced in many colors.

Another new product of the United States Rubber Co. is a plastic foam insulating material, that is said to combine exceptionally low thermal conductivity with very light weight. Present applications include transportation refrigeration in trucks, railroad cars, ships and airplanes. The new material, called U. S. Flotofoam, is non-corrosive, non-toxic and self-extinguishing. It will not support mold or bacteria growth and holds its insulating value over a wide range of mean temperatures.

The snow-white plastic foam is available in shredded or block form. The shredded form weighs from .8 to one lb a cu ft, and the block form from .8 to 1.5 lb cu. ft. Blocks and slabs can be produced in a variety of sizes and shapes to fill cavities, and surfaced with paper, cloth or resin coatings. The shredded form, which is easy to pour and pack into irregular cavities, can also be supplied in individual containers, ready for installation.

K-112—Standardized Spot Welding Guns

A line of standardized spot welding guns, made from interchangeable standardized component parts has been brought out by Progressive Welder Co., Detroit 12, Mich. Seven basic gun types, in heavy duty and standard duty versions, will take care of 95 per cent of all gun welding requirements, it is claimed. Moreover, a gun can be quickly converted to a different job by changing one or two standard parts.

Basic standardized components of the welding guns are the gun chassis, the "jaw extensions", the interchangeable hydraulic or air operating cylinders, optional cable locations, handles, and "universal" cable terminal clamps, switches, electrodes, and electrode holders.

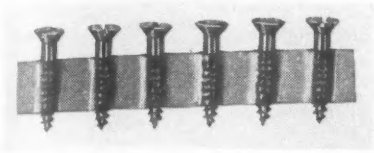
With this standardization of component parts it is possible to obtain as many as 57,600 variations with a single basic gun chassis, while varying only the jaw extensions and standard electrodes.

K-113—New Method of Packing Screws

The Continental Screw Co., New Bedford, Mass., has introduced a new method of packing wood screws, machine screws and sheet metal screws, for manufacturers who supply screws with their products.

Holtite screws, securely attached between plain or colored tapes, are

furnished with any number of screws up to 12. Continuous tapes containing thousands of screws can be supplied on spools, with counting marks if desired. All colors or combinations of colors of cellulose tape



Holtite "Taped" screws

or paper can be furnished to simplify inventory and to insure correct packing of different types or quantities of screws. Small size screws can be supplied with points covered to prevent scratching finished surfaces of other parts included in package.

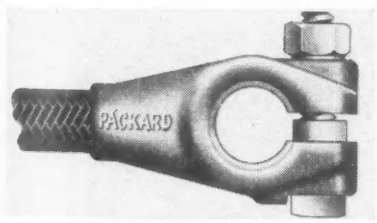
Holtite "Taped" screws are furnished with slotted or Phillips recessed heads.

K-114—Light Weight Ball Bearings

Savings in space and weight without sacrifice of load bearing strength are design features of the XLS bearing series being manufactured by the Federal Bearings Co., Inc., Poughkeepsie, N. Y., according to the company. Light and compact with uninterrupted deep groove races, they are said to be capable of taking substantial thrust loads in either direction, as well as heavy radial loads.

The XLS Series is produced in sizes from 1⅜ in. to 10 in. bores with outside diameters from 2 9/16 in. to 13¼ in. In the small XLS bearings, the cross section area through any pair of races may be only 68 per cent of the area of a corresponding light series metric size

K-115—Lead Type Battery Terminal



A redesigned lead-type battery terminal — moulded of Packard Lead-Alloy around a strong steel insert, has been added to the line of the Packard Electric Division of General Motors Corp., Warren, Ohio.

A new compression sleeve prevents distortion and covers the terminal bolt, preventing corrosion. Other new features include heavy streamlined design, ease of application and removal of the thread shield.

NEW ★ PRODUCTS

For additional information regarding any of these items, please use coupon on page 60

bearing. In the larger sizes, this area may be as small as 33 1/3 per cent of the area of corresponding size metric bearings. Such design provides a bearing that effects a saving in weight and in space without sacrificing too great a proportion of the load carrying capacity.

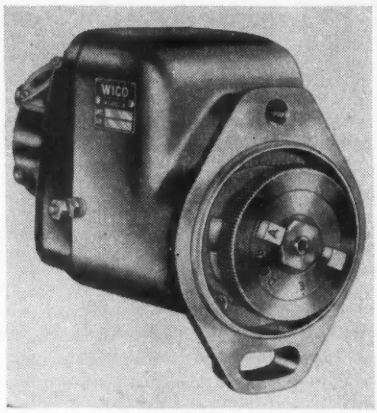
As a result, according to the company, these bearings may find application in compact clutches; in thin-walled housings; for large diameter shafts where the load is such that extremely high carrying capacity is not required of the bearing; in instrument or actuator design and in fact, wherever the space available for bearing installation is at a premium and weight saving of prime importance.

K-116—Magneto Coupling Flange

An adjustable coupling for flange mounted magnetos is now available, for the first time, on certain models made by the Wico Electric Co., West Springfield, Mass. This advance in magneto design is said to be valuable because of the many variations in magneto drive lug locations in relation to advance spark timing on tractors and engines of different makes. It has been necessary for magneto suppliers to stock a number of different impulse couplings to meet the replacement requirements of their customers—even though the mounting dimensions, number of cylinders and the direction of rotation may be the same.

This new development provides an impulse coupling with an adjustable lug plate that can be set to any position required by any engine application.

There are two models of four-cyl S. A. E. flange mounted magnetos equipped with these adjustable lug plates; the XH2500 which rotates clockwise and the XH3000 which rotates counter clockwise. A knurled lock nut, with two set screws and a tool hole, tightens around the lug plate. On the lug plate are five marked positions, lettered A through E, and providing five different lag angles at which the lugs can be set.



Wico adjustable coupling shown mounted on model X magneto.

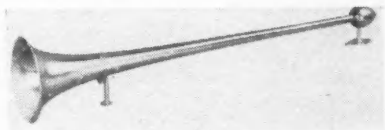
Through this new adjustable lug plate, magneto replacements can be made on 68 different models made by eleven different engine manufacturers with the two different magneto models.

K-117—Center Punch for Hard Materials

A new automatic center punch for glass and hardened steels—having a tip made of Carboloy cemented carbide—has been placed on the market by Vinco Products, Asbury Park, N. J. The new Model C-20 permits the routine marking of materials on which ordinary steel punches would become dull almost immediately, it is claimed.

The marker is four in. long, weighs 1½ oz, and contains a spring-actuated hammer tripped by pressure on the punch. Pressure of the spring may be adjusted to anywhere between 8 and 20 lb by means of an adjusting screw. At the lowest pressure setting, a "shock absorber" action permits adjusting the blow so that glass and light gage metals can be center punched for subsequent operations without shattering or distorting them.

K-118—New Type Air Horn



A new type air horn that automatically adjusts itself to give full range and volume on any air pressure from three to 250 lb is being introduced by the Buell Manufacturing Co., Chicago. Other features of the new horn include a streamlined miniature jet engine housing for the sound unit, and Buell "controlled volume." The "controlled volume" feature is standard on all Buell air horns using a hand throttle rather than a foot control. Thus, Buell air horns can be sounded softly and politely or opened up to full power for emergencies.

NEW Products for AIRCRAFT

For additional information regarding any of these items, please use coupon on page 60

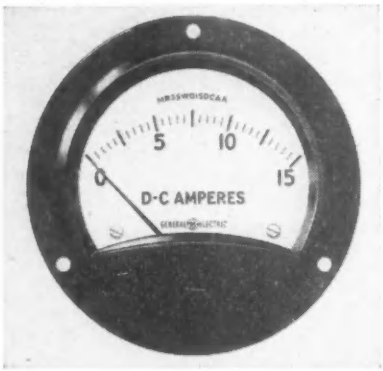
K-119—Improved Type Panel Instruments

A new line of 3½-in. panel instruments of internal-pivot design, suitable for use in aircraft, has been brought out by the Meter and Instrument Divisions of the General Electric Co., Schenectady, N. Y.

The new instruments, designated as Type DO-71, have been especially designed for better readability. The elimination of arc lines and distracting printing from the scale and the use of a lance-type pointer and large, clear numerals are claimed to assure accurate readings.

The internal-pivot construction of the new instruments materially reduces their depth behind the panel, thereby increasing their suitability for apparatus in which compactness is essential.

A high-strength Alnico magnet provides high torque which makes for quick response and good damping so



G-E 3½-in. ammeter

that the moving system follows changes in current or voltage rapidly and accurately. The high torque allows the use of larger-radius pivots, resulting in increased resistance to shock and vibration, according to the manufacturer.

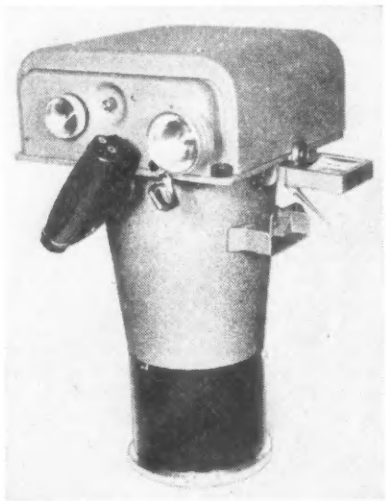
The large clearance in the air gap between the pole faces and core minimizes the possibility of the stickiness caused by the collection of dirt and foreign particles in the air gap under adverse conditions.

K-120—Hand-Held Aerial Camera

A new hand-held 5-in. by 7-in. aerial camera with 20-in. telephoto lens has been announced by the Fairchild Camera and Instrument Corp., Jamaica 1, N. Y., to meet the demands of aerial photographers who desire large-scale photographs with reasonably large negative size while flying at safe altitudes over urban areas.

The new model, designated the Fairchild F-275, contains a Bausch & Lomb f5.6 20-in. telephoto lens. Negative size is 5 in. by 7 in. and either roll or cut film can be used. An iris diaphragm permits lens openings from f5.6 to f45. The focal plane shutter is adjustable for speeds of 1/125, 1/175, 1/225, 1/300 and 1/400 of a second. A direct vision view finder is an integral part of the camera, and folds up when not in use.

The standard camera is equipped for use with roll film. The roll film back holds sufficient film for as many as 40 exposures, but shorter length of film for fewer exposures may be used. A Fairchild Aerotype cut film



Fairchild telephoto aerial camera

magazine accommodating 12 sheets of cut film, and standard red and yellow filters are available as optional accessories. The camera complete with lens weighs 20 lb, and its overall length is 18 in.

K-121—Differential Pressure Gage

The Kollsman Instrument Division of the Square D Co., Elmhurst, N. Y., has developed a sensitive differential pressure gage featuring high sensitivity combined with a wide range of indication. Of value in all cases where sensitive differential pressure measurements are required, the Kollsman sensitive differential pressure gage is said to be particularly applicable to laboratory and flight testing of jet turbine engines. This instrument has a differential range of from 0 to 300 in. of water, and a working pressure range, or difference between the inside and the outside of the case, not exceeding 60 psi. It is calibrated so that its main pointer

Kollsman sensitive differential pressure gage

makes one revolution for every 10 in. of water. Thus, for full range, the pointer makes 30 revolutions.

The Kollsman sensitive differential pressure gage is capable of measuring a differential pressure as small as 0.1 in. of water with a corresponding pointer tip movement of 0.075 in. The instrument is compensated for temperatures from —30 C to 50 C.

K-122—Self-Locking Control

A new design of aircraft self-locking control is now in production at the Lynn Co. of Burbank, Calif. The new throttle control is designed to overcome the tendency of vibration in aircraft to cause control levers to creep, allowing settings to change while the aircraft is in flight. The design of the Lynn self-locking throttle control does not increase the load on the knob because of the locking feature above the load inherent in the control system. The take-off lever is immovable, but actuation of the primary or knob lever permits free movement of the secondary or take-off lever. Movement of the control is said to be instantaneous without the necessity of releasing locks or latches.

The unit fits on standard 1½-in. diameter aircraft quadrant hubs, and is no thicker than conventional non-locking throttle control lever assemblies. This new control is adaptable to all types of aircraft, and may be utilized in single or multiple control quadrant assemblies. The unit may be incorporated in standard types of brackets and combined with mixture control levers. Handle length and shape is varied to suit individual installation problems.

Application of the self-locking feature is not confined to throttle controls, but may be utilized in other control installations which could be adversely affected by vibration-induced changes in settings.

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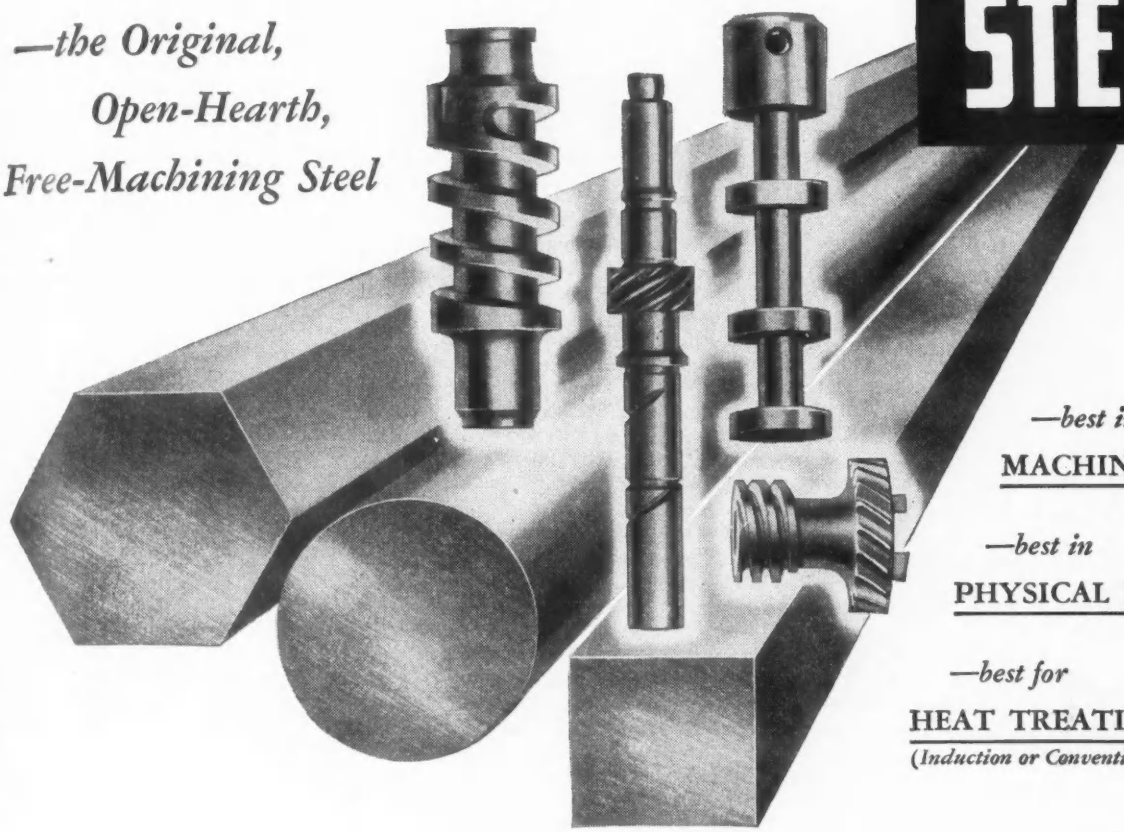

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Acclaimed, from the very beginning, for its outstanding properties, JALCASE *still is the outstanding steel in its class today!* Its performance is unsurpassed when compared with that of similar steels.

JALCASE is available in many grades each, of which is applied to suit the application. Typical JALCASE analyses are found in the A.I.S.I. 1100 series wherein the manganese content is 1.00% to 1.65%, such as in Grades C-1117 through C-1144.

JALCASE is supplied as cold-drawn or cold-drawn-with-metallurgical-processing such as special and varied tempering treatments. These thermal treatments are designed to improve physical properties, machinability, provide minimum distortion and increase wear resistance. Thus, many parts made of this material may need no further heat treatment after machining.

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Tooling Requirements of French Automobile and Tractor Plants

By W. F. Bradley

Special European Correspondent
of AUTOMOTIVE INDUSTRIES

JUST how the Marshall Plan will be applied to the French automobile industry appears to be unknown in Paris. The United States Embassy does not expect to have any definite information on this subject for a month and at the French Syndicate of Automobile Manufacturers the scheme is described as still being in a "nebulous" state.

In all probability the application of the plan to the industry will come under the direction of the Ministry of National Economy, which will work through the Commissaire for the Monnet five-year plan, contacting with the Chambers Syndicales for the various branches of the industry. So far, however, the nature of the aid is not known and manufacturers have not been asked to indicate their requirements. The production engineer at the State-owned Renault factory stated that he had already drawn up a list of plant and tools he would like to receive and was prepared to hand it in to which ever authority was instructed to deal with this matter. Citroen claimed to have no knowledge of the plan and to have done nothing to meet it. Peugeot's reply was somewhat similar. Throughout the smaller firms a state of ignorance prevailed.

An official report issued in 1946 indicated a need for 55,000 machines, having a value of 18,000 million francs, of which 5600 millions would be for importations, 7500 millions for home-produced tools and the balance for the repair of existing machines. The average age of machines was then 20 years and the application of the postwar plan aimed at progressively reducing this to ten years.

There appears to be little uniformity in the equipment of the French automobile factories. While in some cases the entire plant has been renewed, in others only very rare new equipment has been brought in. One leading manufacturer gave it as his opinion that the situation was very much better than was generally imagined. In 1939-40 there was an elaborate program for the re-equipment of the factories which was never executed. Orders were placed, however, and it is only recently that these have been filled on very advantageous terms for the buyers, if at a heavy cost to the government.

During the German occupation, the Comités d'Organization, which since has been abolished, did very much towards laying the foundation for a reorganization of the industry, centralizing information, and thus benefitting the industry as a whole. Of the 4000 machine tools which were taken away or destroyed by the enemy, practically all have been returned. Not only has the same tonnage been received, but the quality is higher. France was able to buy plentifully of the surplus stocks put on the market by the British Government at the end of the war. There was very little purchase of American surpluses, but the 1939-40 contracts have been executed.

Present requirements appear to be in order of importance: Ball bearings, followed by machinery for the manufacture of ball bearings. During the war bombing attention was specially directed towards ball bearing factories, with the result that all were damaged or destroyed. The resultant shortage has not yet been made good. Renault purchased the S.R.O. ball bearing factory in the southeast of France, near the Swiss border, and this is devoted towards meeting a part of its own requirements. Other requirements are rolling mills, gear cutters, grinders, boring machines, and specialized plant for big production foundry work. The 1946 Government report indicated a requirement of 17,000 lathes. This requirement, it is stated, has already been met and the number of new lathes needed for the automobile industry is very small. Drilling machines were indicated at 10,000 and milling machines at 8000, but since then both requirements have very largely been met.

Emphasis is being placed at the present time on increased tractor production, for which new plant is required. At the beginning of the year output was 1000 tractors per month, of which Renault produced 400. Plans are now being studied for the enlargement and re-equipment of the Renault shops at La Mans, to meet the government requirement of a total of 1500 tractors per month. Hotchkiss has converted its tank factory for the production of a creeper-track machine with a gasoline engine. The French Ford factory is expected to produce a tractor at an early date and E.E.C. Mathis is planning to reequip his factory at Strasbourg for the production of the Moline tractor.

Automatic Mixture Control

(*Continued from page* 43)

certain other design considerations. The systems in Fig. 3 use a metallic bellows which is sealed, making the system sensitive to absolute manifold pressure. Systems in Fig. 4 use a non-metallic (Neoprene or leather) diaphragm and are sensitive to the difference between the manifold pressure and atmospheric pressure. Of course, by not sealing the bellows in Fig. 3, these systems could also be made sensitive to gage pressure. The configurations in Fig. 4 will in this way correct for exhaust back pressure; however, the correction is more than is normally required. Choice of a sealed system or use of a diaphragm is optional as the changes in exhaust back pressure are small.

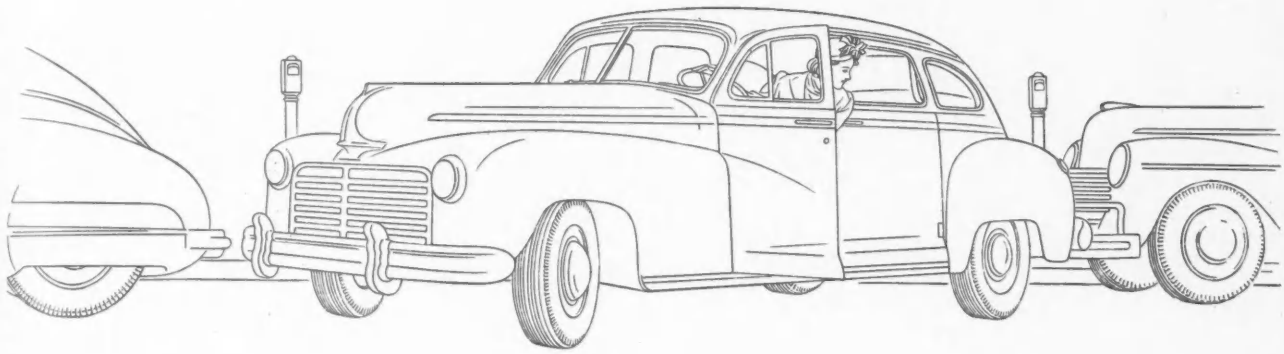
Assuming engine airflow data are available, the slope of the airflow-manifold pressure curve (Fig. 1) is then calculated. (Data from engine operation with carburetion can be used.) Likewise, the slope of the fuel flow-capacity control lever curve (Fig. 2) is also calculated. With this information and the desired fuel-air ratio, the pressure sensing unit can be designed. The mechanical linkage is controlled by the stroke of the C.C.L. and the maximum stroke of either the diaphragm or bellows. For instance, a bellows stroke of ½ in. is feasible while the maximum stroke of a diaphragm is on the order of ⅜ in.; the latter is restricted to a certain extent to the stroke for a constant effective area of the diaphragm. If the stroke of the C.C.L. for engine operation from idle to wide open throttle is assumed to be ½ in., a direct linkage could be used with a bellows. The effective area is established from the required force to move the C.C.L. If, for example, two oz. (⅛ lb) is necessary, and it is desired that the system be sensitive to 1/10 in. Hg (0.05 psi) manifold pressure, the effective area necessary is:

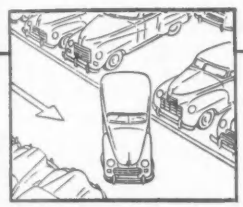
$$A = \frac{\text{Force}}{\text{Pressure}} = \frac{\frac{1}{8}\text{ lb}}{0.05\text{ psi}} = 2\frac{1}{2}\text{ sq in.}$$

(*Turn to page* 56, *please*)

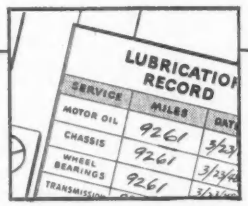
Anti-friction Steering Ease

with Torrington Needle Bearings



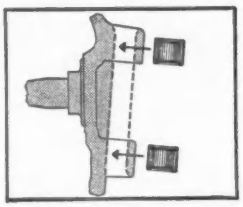


Parking is easier . . . for anti-friction Needle Bearings make wheels easier to turn, especially at slow speeds.



Long-lasting lubrication . . . because Needle Bearings are designed to "hold in" oil or grease . . . keep out dust and dirt.

Better Wheel Alignment is maintained . . . cutting tire wear and reducing service jobs—two economies for your equipment, too.



Cut-away View Shows how Needle Bearings mean compact, lightweight, high-capacity design in automotive kingpins.

NEW EASE AND FREEDOM in steering . . . savings in lubrication and maintenance . . . reduced wear and longer service life are provided by anti-friction Needle Bearings in kingpins of many of today's new cars. The compact design of these high-capacity units plus their efficient lubrication makes them ideal for bringing anti-friction performance to many points in automotive design.

Wherever wheels or shafts turn—in aircraft, farm machinery, machine tools, industrial equipment or home appliances —Needle Bearings bring advantages in operation and construction. The lightweight, unit design means easy fabrication and assembly . . . makes possible size and weight reductions in related elements.

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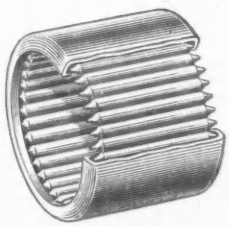

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The 1/10 in. Hg. sensitivity is considered sufficient for automobile applications. The system spring rate is calculated from the total bellows displacement, the range of manifold pressures and the effective area of the diaphragm or bellows, as follows:

$$K = \frac{PA}{L}$$

where K = spring rate, lb per in.
P = manifold pressure change from closed to wide open throttle, psi
L = bellows stroke, in.
A = bellows effective area, sq in.

In the case under consideration,
A = 2½ sq in.
L = ½ in.
Assume P = 7½ psi

$$\text{therefore } K = \frac{7\frac{1}{2} \times 2\frac{1}{2}}{\frac{1}{2}} = 37\frac{1}{2} \text{ lb per in.}$$

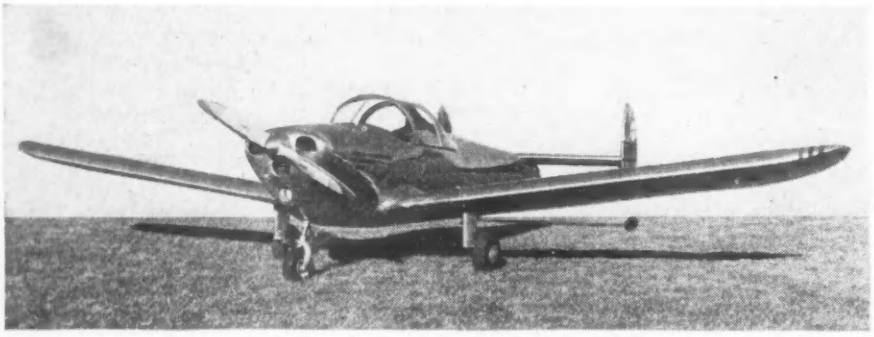
If a bellows is used, the spring rate of the bellows must be considered. The auxiliary spring is designed to make up the difference between the required rate and the bellows rate. In the case of a diaphragm, the spring rate of the diaphragm is nil and the auxiliary spring should be designed for the system rate. As previously mentioned, in the case of a diaphragm the design must also consider any changes in effective area with stroke. Inasmuch as the spring rate of springs can not be held closer to 10 per cent with the usual manufacturing techniques, it is recommended that the spring design incorporate a feature to adjust the spring rate. This can be done by changing the number of effective coils. Also to be considered in the spring design is the change in spring rate with changes in temperature. This condition can be overcome by making the spring from materials such as Iso-elastic (John Chatillion & Sons) or NI-Span-C (H. A. Wilson Co.). The modulus of these materials does not change with temperature, thus making them especially suitable for these installations. If service operation indicated that the variation in control temperature is small, steel springs could be used. These materials have been mentioned in order to forestall errors from variations in temperature. The design should also consider the effects of thermal expansion of the parts of the sensing system.

Enrichment can be incorporated by a cam mechanism between the pressure sensing unit and the C.C.L.; proper linkage to give an effect similar to the cam mechanism; or several springs in the pressure sensing system such that one is disengaged when the manifold pressure is reached where enrichment is to begin. Although the cam mechanism provides the greatest flexibility, all three types have been used successfully.

Control systems as outlined were commercially used during the war on various German Aircraft engines (BMW, Dialer-Benz and Junkers); and recently Great Britain announced a postwar automobile development (Thornycraft Engine) having a similar control (see AUTOMOTIVE INDUSTRIES, Oct. 1, 1947). These are sufficient to testify to their reliability and practicality.

Although several experimental American fuel-injection engines have been equipped with manifold pressure controls, none have as yet been installed in service. The one American commercial fuel-injection engine, the Wright R3350, is equipped with a different type of system. While this system requires an accurately calibrated pump, the pump is not used as a metering unit, but merely as a distributor. This system uses a complete aircraft venturi-type carburetor to measure the airflow and meter the fuel. The fuel is then delivered to the pump to be distributed. The complexity of such a system is evident.

1948 ERCOUPE



The new 1948 Ercoupe is powered by 85-hp Continental engine, providing a top speed of 120 mph. A larger nosewheel, with a 5:00 x 5 tire, is a feature of the new plane.

Important 1948 Innovations

(*Continued from page* 38)

admittedly successful four cylinder engine. I think it is primarily a situation where nothing else is available. Certainly a good 274 cu in. V-8 would not be much heavier than the four and a stroke reduction from 4.625 to 3.500 would permit much higher peaking speeds with a gain in power output and reliability of reciprocating parts.

More War-Built Plants Under Recapture Clause

Latest move by the Munitions Board in the national defense program has been to place an additional 114 surplus war-built plants on the list of facilities which can be disposed of only through contracts containing governmental recapture clauses. Included in the list are a score of aviation, automobile, rubber-making, and oil refining facilities. Also added to the standby list were about 40 steel, aluminum and other basic metals facilities.

This action by the Board raises to 423 the number of war-built plants which will be retained in a condition readily convertible to war production in 60 to 100 days in an emergency. Of the total, 151 complete plants have been retained by the military establishments under Public Law 364. These consist largely of aircraft factories, combat vehicle plants, specialized metals products factories, shipyards, ordnance and ammunition facilities, and arsenals.

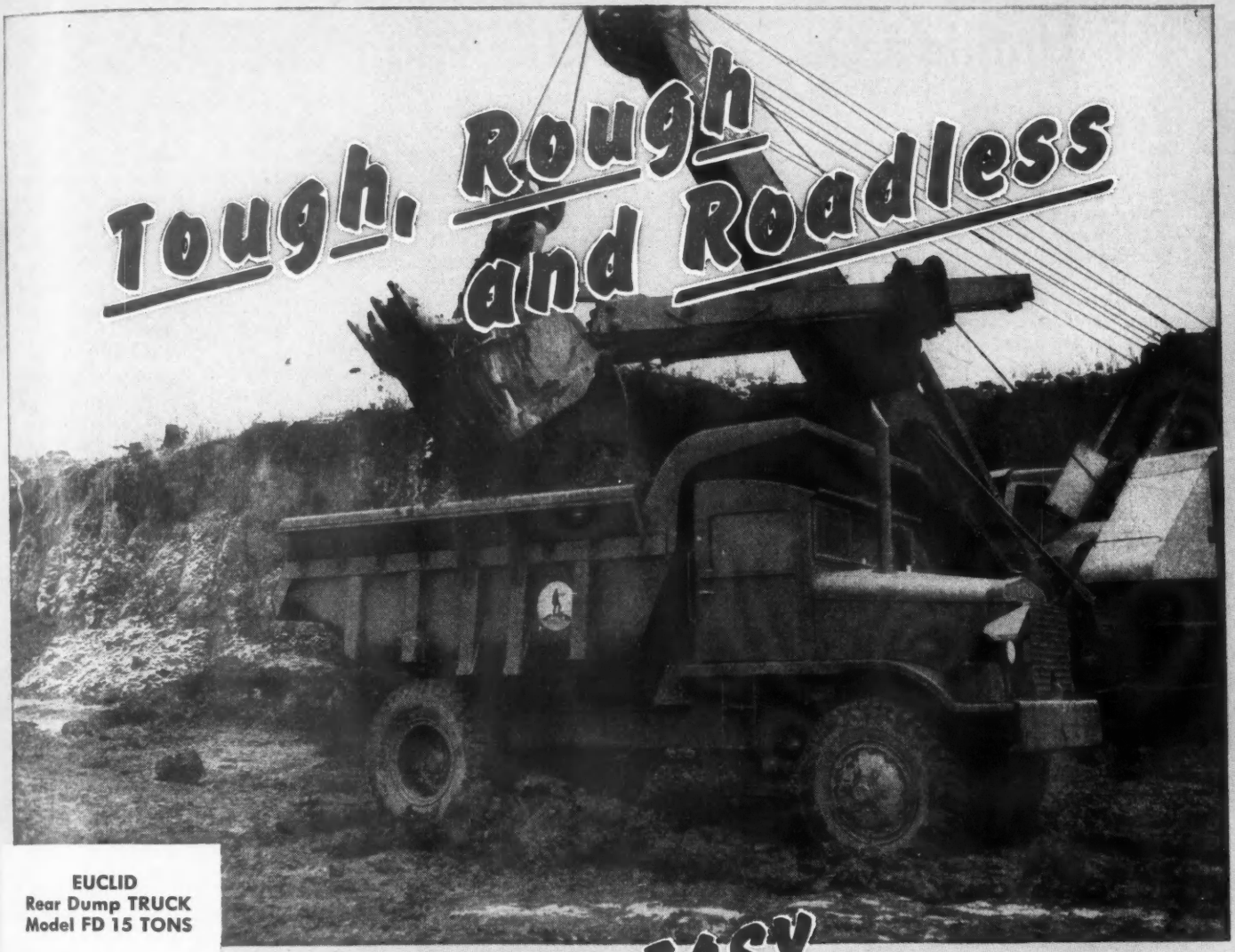
Another 158 plants were already on the retention list, disposable only by contracts containing the National Security clause. Of these, 31 have been sold by War Assets Administration and an additional 30 have been leased by WAA to private industry. About 23 are producing peacetime goods for both domestic economy and peacetime military requirements while 28 of the remaining 62 are of such nature as to virtually prohibit private operation without extensive conversion. These latter will likely be maintained by the Government.

Another recent move to preserve war production potential was the White House order, through the Bureau of the Budget, authorizing the set-aside of an additional 90,000 machine tools. Originally, only 92,000 were to have been tagged and stored against future need. This latest action guarantees 182,000 machine tools on hand and ready for installation should an emergency require.

Since this mobilization planning is

(*Turn to page* 72 *please*)

Tough, Rough and Roadless



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Rear Dump TRUCK
Model FD 15 TONS

but steering is EASY

with VICKERS HYDRAULIC POWER BOOSTER

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The Vickers Hydraulic Power Steering Booster is compact, rugged, powerful. Installation is simple and requires minimum space. Lubrication is automatic. Write for Bulletin 47-30 for all the facts about Vickers Hydraulic Power Steering.

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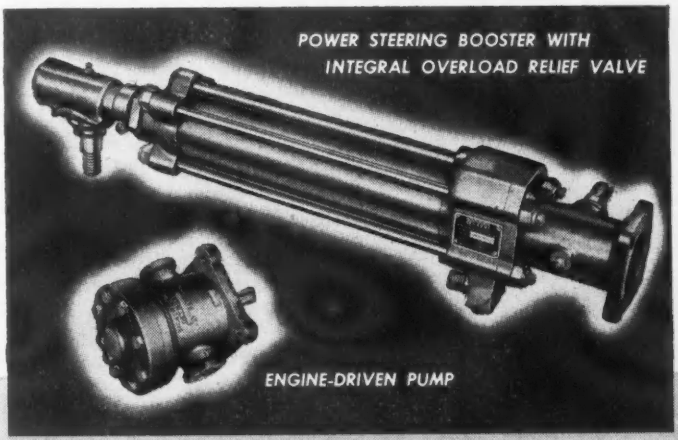

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Unfilled Orders Greater Than Year Ago

(*Continued from page* 25)

has led to some fears that automobile production may be curtailed. The coal strike and threats of impending strikes against automobile manufacturers also have had their effect in spurring new orders.

Against the pressure of the increasing volume of new orders, automobile builders have actually been losing ground in the production race. Since the first of this year, Chevrolet, for example, has experienced an increase of 40 per cent in its unfilled orders, indicating a reserve of 1.5 million on the basis of figures released late last year. Oldsmobile's backlog jumped from 386,000 to 431,000 between Jan. 1 and May 1 and at that time was 60 per cent higher than a year previous. Pontiac built 72,000 cars between the first of the year and April 15, but in that period its unfilled orders climbed from 511,000 to 567,000. Cadillac in late April had a total of 120,000 orders on hand, a rise of 30,000, or 25 per cent, since Jan. 1. Buick did not release any official figures, but it is understood that unfilled orders stand in the neighborhood of 550,000.

Ford put its orders through a drastic wringing out process to remove duplications, but still came up with nearly 1.6 million as of the middle of April. By now, with the introduction of new Lincoln and Mercury models, the backlog probably has increased, and when the new Ford is announced in June undoubtedly will soar much higher.

Studebaker reports that it has enough firm passenger car orders on hand to take a year and a half of production, with light truck orders about a year behind. Nash deliveries now are from nine months to a year behind, but when new models are announced later this year, the backlog is expected to increase to the point that it will require from 18 months to two years to catch up. Packard says it can not possibly make enough cars this year to fill its booked orders, and that in many cases dealers are not taking new orders. Hudson has not announced any numerical count or other type of estimate on the size of its backlog, but states that the pressure is greater than ever for its new models. Kaiser-Frazer, which a few months ago was building cars faster than dealers were selling them, reports now that the demand is such that dealers are on a strict allocation basis. Production has been stepped up to a six-day, 53-hour week basis with one shift, although output is not as high as it was on two-shift operations that prevailed last winter.

As a result of the boom in new orders, some automobile sales managers have revised their opinions about how long the sellers market may last. L. W. Ward, Pontiac sales chief, says it may take five years before the constantly growing demand for cars is met. D. E. Ralston, general sales manager for Oldsmobile, says there is no indication that a return of the buyers market is in sight for this year or next. Others in the industry have various other opinions about how long the market will stay hot, but in all cases they are optimistic. Little is heard anymore about the market fading this year. On the basis of visible evidence of mounting orders, they appear to be on solid ground.

There is no way, of course, to determine what percentage of backlog orders represents actual replacement needs as compared with the number buying a new car even though their present vehicle may still be eminently satisfactory from a service standpoint. There is considerable evidence that many owners of 1945, '46, and even '47 cars are back in the market for new models. However, approaching the problem of demand on the basis of actual replacement needs turns up heavy supporting evidence that millions of cars now on the roads would be replaced if new cars were available.

In the April issue of *Survey of Current Business,* publication of the Commerce Department, Government economists point out that as a result of the continued abnormally low scrappage rate, the number of overage cars which owners normally would replace increased to between five and six million by the end of 1947. According to R. L. Polk & Co., the number of cars in use 10 years old or more increased from 5 million in 1941 to 11½ million in mid-1947. Cars 12 years old or more increased from 2½ million to 5½ million during the same period.

The Commerce Dept. says further that while scrappage rates will be higher when cars again are in good supply, evidence suggests that the prewar trend toward higher scrappage age of cars will continue, and predicts on the basis of previous studies that the average age will be 12 years, or 20 per cent higher than the 1939 figure. On the basis of gasoline consumption, it is estimated that the cars would have been driven about 100,000 miles before being scrapped. On the basis of a 12-year scrappage age, 5½ million cars were in need of replacement at the end of last year, and if the 1939 practice of scrapping at about 10 years were followed, the total needing replacement would have been about 11½ million at last year-end. Another interesting point is that of approximately 30 million passenger cars registered at the end of 1947, at least 23½ million were prewar cars, the youngest of which were six years old. Consequently, the market on a replacement basis alone should assure high production for several years, to say nothing about supplying the large number of persons who are buying a new car for the first time.

In spite of the phenomenal demand for new automobiles, the industry has not been able to hit a production stride that will make much of a dent in the backlog of orders. Material shortages and strikes within the industry and outside it have continually upset schedules since production started after the war. Last year was a fairly good one production wise, but not nearly good enough to meet the demand. In the early postwar months, optimistic estimates of 6-million-car years often were heard, but no one talks about that anymore. At the outset of 1948, it was thought that the industry could build from 10 to 15 per cent more units this year than it did last year, for a total of about 5.5 million cars and trucks, of which about 4.5 million would be passenger cars. However, shortages of fuel gas during the winter, the coal strike, and the continued tight steel supply have led to forced cutbacks, and it now appears that the industry will do well to build as many units this year as it did in 1947. Not only did the coal strike cause a loss of an estimated 215,000 cars, but the prospects for more steel that had been expected in the late months of this year are now more uncertain because of possible requirements of the Marshall Plan and the re-armament program which probably will start to feed on the material supply late this year. Just how much effect these two programs will have on the automobile industry is not yet known, but even a small diversion will be felt since the industry cannot get as much steel as it needs now.

A New Industrial Tire

A new pressed-on industrial rubber tire, the DeLuxe Cushion, designed to help meet all operating requirements of power driven industrial trucks and tractors is a recent development of the B. F. Goodrich Co., Akron, Ohio. The tire is made with two designs; smooth and non-skid tread.

A new tire has a greater profile height, and a more rounded and thicker tread. According to the manufacturer, it is constructed of an improved, highly resilient rubber compound which offers great resistance to cutting and chipping.

USER REPORT:

"Our average brake maintenance cost .....$0.00085 per mile."

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July 10, 1947

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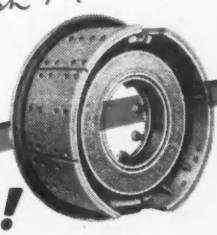
We are satisfied that no other type of power brake could have given us the low maintenance cost of your electric brakes. However, we would like to know if our costs are comparable with other fleets using Warner Electric Brakes.

Your brakes have been used exclusively on all our equipment since 1932.

Very truly yours,

SCHMIDT TRUCK LINES
By Adolph Muehring



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H-131—Bearing Application

New Departure Div., General Motors Corp.—Outline of Procedure in Bearing Application is the fifth of a series of Engineering Service books issued by the company. The 20 pages give a brief outline of the principal steps required in developing a successful ball bearing mounting. Frequent marginal references are made to make it easier to gather additional data from other books in the series which cover those subjects in more detail.

H-132—Protective Oil

Oakite Products, Inc. — A new Service Report has been announced, providing helpful data concerning Oakite Special Protective Oil, a specialized material designed to furnish efficient rust-protection of metal parts in production, in storage, etc. The Service Report provides the latest data available on this rust-preventive material and incorporates an interesting flow chart showing strategic points in the production process where the special oil supplies effective anti-rust protection.

H-133—Galvanic Corrosion

The International Nickel Co.—A new booklet discussing various aspects of galvanic corrosion has been issued, designed for the production man and the research engineer. The booklet not only covers some of the factors influencing galvanic corrosion but also presents data on how galvanic effects can be minimized.

H-134—Heat Transfer Products

Young Radiator Co. — A new 20-page catalog, No. 148, describes and illustrates radiators for automotive and industrial application; air condition equipment; aircraft heat transfer products; heat exchangers, etc. Information and photographs concerning the company's research, engineering and production departments are included.

H-135—American Standards

American Standards Assoc. — An up-to-date list of all national standards approved by the American Standards Association has been published and is available from the association at 70 East 45th Street, New York 17. The list includes national standards for such important problems as dimensions of machine tools and parts, rating and testing of electrical equipment, dimensions and identification of pipes and piping, definitions, abbreviations and symbols used in technical literature.

H-136—Storage Battery Research

Gould Storage Battery Corp. — Recently released is a new 16-page fully illustrated booklet, Better Batteries for Industry Through Research. Principal subjects treated include; the analysis and control of battery metals through the use of the ultraviolet spectrograph and densitometer; instantaneous voltage and current characteristics as studied by cathoderay oscillograph, etc.

H-137—Grinding with Oil

D. A. Stuart Oil Co., Ltd. — A completely revised edition of the booklet Grinding With Oil, a 20-page catalog and handbook of grinding information, is available. It contains data on the application of Stuart oils to precision grinding projects. Sections are devoted to the selection of proper oils and grinding wheels and wheel marking systems. Tips for handling grinding oils are listed.

(*Turn to page* 62, *please*)

TIME SAVER COUPON for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.

Readers' Service Dept.,
Automotive Industries,
Chestnut & 56th Sts., Philadelphia 39, Pa.

Please send me: **These FREE Publications** (Use letter and designating number of each item desired)	*Please send me more information on:* **New Production and Plant Equipment** (Use letter and designating number of each item desired)	*Please send me more information on:* **New Products** (Use letter and designating number of each item desired)
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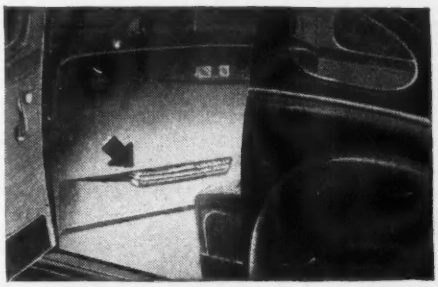
FOR MICRO*STYLING THAT SELLS -

You can't beat "LUCITE," the time-tested plastic



FLOOR-LIGHT LENS OF "LUCITE." It's a MICRO-STYLING possibility that could make a fine impression . . . especially when it's designed for beauty *and* long-lasting service with "Lucite."

A SMART-LOOKING HOOD ORNAMENT of weather-resistant "Lucite." One of 99 parts molded of "Lucite" now used on 17 makes of automobiles. Keeps its sparkling color and handsome design through years of hard outdoor service.

Molded by *Hoosier-Cardinal Corporation, Evansville, Ind.* and *Michigan Molded Plastics, Inc., Dexter, Mich.*

* WHAT IS MICRO-STYLING?

MICRO-STYLING is the design of small but important automobile accessories for beauty and utility too. A sparkling tail-light lens . . . a handsome horn button . . . an ash-receiver handle that looks and feels luxurious . . . a host of little things aimed to impress the customer. MICRO-STYLING can help sell and *re-sell* your cars . . . to buyers who are becoming more and more style-conscious. But remember—it calls for *the best* in quality materials . . . and that means Du Pont "Lucite"!

HERE ARE some of the advantages that make "Lucite" your wisest investment for MICRO-STYLING:

LONG-LASTING COLOR—"Lucite" comes in a wide range of color-fast hues, transparent, translucent, and opaque. They hold their beauty through years of weathering and hard service. They have since 1937.

SPARKLING TRANSPARENCY—Smartly designed dial faces, lenses, etc., of crystal-clear "Lucite" transmit up to 92% of light. "Lucite" can "edge-light" and "pipe" light around curves.

LUXURIOUS SMOOTHNESS—You'll notice right away the soft, smooth look and feel of knobs and handles made of "Lucite." And it withstands sharp knocks . . . it's not brittle.

OUTSTANDING DURABILITY—Pieces made of "Lucite" last for years and years . . . retain full beauty and utility even in exposed parts. In normal use, it is not damaged by gasoline, lubricants, or by many common solvents that cause crazing in less durable plastics. And "Lucite" is readily molded and machined.

FROM EVERY ANGLE, "Lucite" is *the* practical plastic for giving your car the MICRO-STYLING touch that means so much . . . that will help to sell your car again and again.

WRITE FOR FREE LITERATURE on "Lucite" and other Du Pont plastics. No obligation. If you wish, Du Pont technical men will be glad to consult with you in confidence and advise on applications of Du Pont plastics to help your MICRO-STYLING plans. Address E. I. du Pont de Nemours & Co. (Inc.), Plastics Dept., Room 206, Arlington, New Jersey.

Tune in to Du Pont "CAVALCADE OF AMERICA," *Monday nights—NBC coast to coast.*

DU PONT
REG. U.S. PAT. OFF.
Plastics
BETTER THINGS FOR BETTER LIVING THROUGH CHEMISTRY

PUBLICATIONS

(*Continued from page* 60)

H-138—Abrasive Belt Machines

Porter-Cable Machine Co. — A 20-page illustrated Miniature Catalog describing their complete line of abrasive belt machines, as well as their portable electric tools has been issued. Included in the catalog is a description of large abrasive machine tools with automatic feed table, centerless belt grinder, tool room surfacers and smaller bench type abrasive belt models. Complete specifications of each machine accompany the descriptions. Applications and economies possible with abrasive belt machines are described. The portable electric tool section lists saws, sanders, edgers, radial saws, etc.

H-139—Welding Electrodes

Air Reduction Sales Co. — A new pocket guide to Airco arc welding electrodes has been announced. The well illustrated guide is thumb-indexed for ready reference. Section titles include mild steel, high tensile steels, low hydrogen weld metal, stainless steels, surfacing, non-ferrous and cast iron. Also included in the guide is an easy-to-read electrode selection table which gives the operator complete information on which electrode to use, its chemical analysis and mechanical properties.

H-140—Single Point Tools

The OK Tool Co., Inc.—An attractive catalog, No. 14, describes and illustrates the company's line of single point tools with inserted bits for lathes, planers, shapers and boring mills. Complete specifications and prices are given for each type shankless and shank tool holder sets. Carbide tipped tool bits and holders, multiple operation tools are illustrated and specifications given.

H-141—Milling Cutters

The OK Tool Co., Inc. — Catalog No. 13 covers modern milling cutters for milling machines. Chapters included give information on carbide milling features; tool adjustment features; application photographs; special cutters; fine adjustments and multiple operation features; specifications tables and price lists.

H-142—Testing Machines

The Baldwin Locomotive Works—Bulletin 282 describes and illustrates Baldwin-Tate-Emery Universal Testing Machine Models 20-35 and 60-35. These machines apply and measure loads hydraulically using precision lapped-ram construction in conjunction with 3-range Tate-Emery-Null Method Dial Indicators. The bulletin gives the principles of operation, the accessories and specifications.

H-143—Geared Motors

U. S. Electrical Motors, Inc.—The use of geared motor power in driving machinery and the presentation of latest electrical motor models are covered in a multi-colored 16-page bulletin by the above company. Advantages of using hardened gears and pinions to obtain greatest wear resistance and methods of attaining hardness are described. Several new models of Syncrogears in single, double and triple reductions are presented and for use in combination with Varidrive units are described and illustrated.

H-144—Projection Papers

Eastman Kodak Co. — A new, 8-page booklet describes the new Kodagraph Projection papers for use with enlargers, projection printers or process cameras. A second booklet describes Kodagraph Contact Paper for contact photocopying.

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CLEANING PROBLEMS
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★ Alkali and Emulsion Cleaners and Strippers
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Presents the News

Automotive Industries is the industrial news magazine of the great industries it serves. No other publication even attempts to compete with it in the presentation of what is NEW and what is NEWS to the interrelated departments, divisions and personnel in the plants where it penetrates to the farthest corners . . . reaches those who buy and influence the buying that amounts to billions of dollars every year.

It abounds with news of new developments in design and engineering, latest disclosures in production methods, over-all industrial news of the industry which appeals to the top administrative, engineering and production executives.

The subscription renewal rate (82.37%) of this leading automotive industrial news magazine indicates its popularity. Its total subscriptions are increasing steadily, paralleling the ever-increasing scope of its effectiveness. *There is no other magazine like it.*

AUTOMOTIVE INDUSTRIES

A CHILTON Publication

Chestnut and 56th Streets ◐ Philadelphia 39, Penna.

Studebaker Expands Truck Line for '49

(*Continued from page* 29)

der, 3-in. bore by 4-in. stroke, 170 cu-in. displacement, rated 80 hp at 4000 rpm with compression ratio of 6.5 to 1. The engine in the 1½ and 2-ton models is six-cylinder, 3-5/16 in. bore by 4⅜ in. stroke, 226 cu. in. displacement, rated 94 hp at 3600 rpm with compression ratio of 6.5 to 1.

Cab comfort is an impressive feature, one of the foremost items being an ingenious ventilating system. Air scoops located at the grille pick up fresh air and pass it under the hood through insulated metal tunnels built in the fender aprons. The flow of air is controlled by foot-operated sliding panels in the firewall.

An exclusive truck heater and defroster unit, the Truck Climatizer (an extra cost item), can heat fresh air during cold weather, providing living-room comfort and ventilation throughout the cab at all times. No stale air is reheated to be used again. A blower forces the air into the Truck Climatizer and defroster vents while regulation of window wings adds to their effectiveness. Controls for the blower, heat regulator and defroster are conveniently located on the instrument board.

Advanced construction of the cab provides the driver with more space than he has ever enjoyed. Besides increased head room, four more inches of hip space are available so that three adults can ride in comfort. Greatly expanded glass area increases visibility by 23 per cent.

Additional comfort features include the favorably located steering wheel; a back support which automatically adjusts itself to the "fore and aft" positioning of the seat cushion; generous elbow and knee room, and the chairheight type of seat with comfortable springs; and combination cross and variable ratio steering which eliminates wheel "fight" and kick-back.

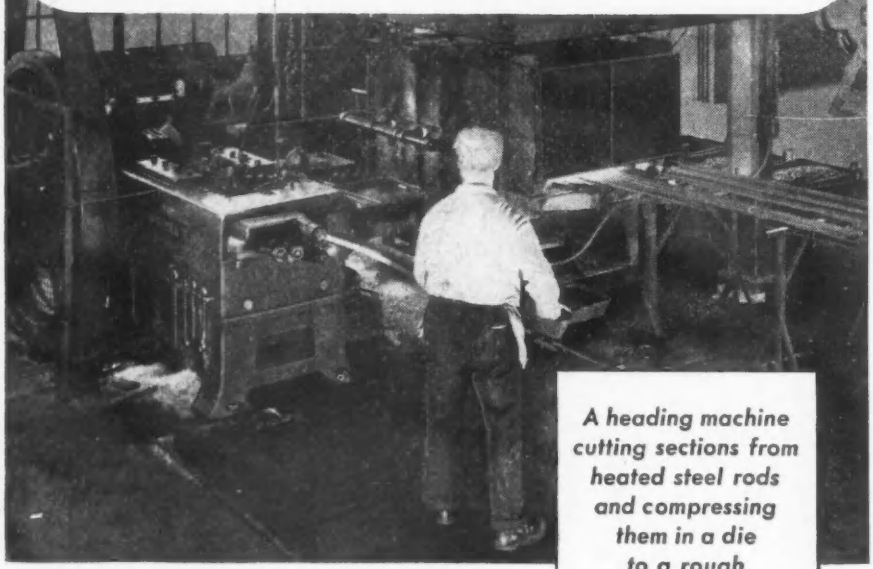
The new radiator grille is heavily constructed for greater strength while the blended fenders are heavier as well as wider. There is greater resistance to impact in the heavy channel-type steel front bumper which attaches directly to the frame side rails. Sealed beam headlights and parking lights are set into the fenders.

Structural frame changes on the new trucks bring the cab lower, making it easier for the driver and occupants to get in and out. There are no outside running boards.

Doors are wider and have a check stop to hold them in open position. Latches are of the rotary type, which automatically adjust for stress and wear. Hardware throughout is heavier. Standard equipment includes hood ornament, dual windshield wipers and sun visors, arm rests, ash tray and a reading and entrance light which operates automatically as the door is opened. Hill-holder is available as optional equipment on all models.

This is How

STROM BALLS are Born



A heading machine cutting sections from heated steel rods and compressing them in a die to a rough spherical shape

The steel is carefully chosen and inspected, even before it gets to the heading machine. After being "born" here, balls are carefully "brought up," through a long series of grinding and lapping operations, to the unbelievably high standards of finish, sphericity and precision which have made Strom Metal Balls the standard of Industry. Strom Steel Ball Co., 1850 South 54th Avenue, Cicero 50, Illinois.

Strom BALLS Serve Industry

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Agriculture, too-

..turns to Unitcastings!

PRECISION MASS PRODUCTION LOWERS YOUR PRODUCT COSTS!

With consumers' demands and manufacturers' costs going 'round and 'round—a more durable, longer lasting product is necessary. The customers insistence in getting the best for his money . . . coupled with higher production schedules means there is less time to make replacement parts and very little room for defects. The product must be made *right* the first time!

Unitcastings provide the answer for those cast parts that have to be tough—that have to stand the gaff! Particular implement manufacturers are people who know their business. Their dealings are usually with economical and thrifty farmers who demand their money's worth. Daily, specifications for agricultural implements are changing to Unitcastings—for more *consistently* GOOD CASTINGS . . . in less time and at *less* cost!

Unitcast Corporation, Steel Casting Division, Toledo 9, Ohio

UNITCAST CORPORATION

ALLOY AND CARBON ELECTRIC STEEL CASTINGS

QUICK QUIZ for PRODUCTION and QUALITY CONTROL MEN

(The Payoff shows up in Your Cost Sheets)

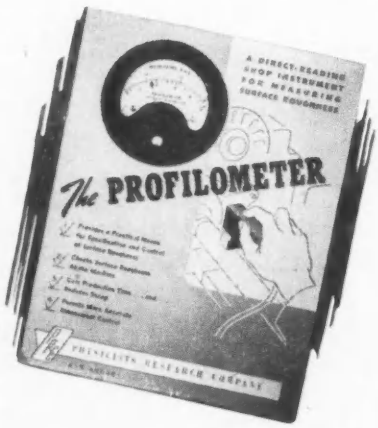
Q: How Can You

- *shorten or eliminate sizing and finishing operations?*
- *detect impending dimensional errors before they occur?*
- *sharpen cutting tools to get more consistent production?*
- *check surface roughness at the machine, in definite microinch units?*
- *save time and money on production jobs where successive sizing and finishing operations are required?*

A: Simply by using the Profilometer in your production department!

This simple, rugged shop instrument will measure the roughness of practically all machined or finished surfaces, directly in microinch units. The relationship of surface roughness to other gaging and control problems is such that, during the past ten years, the Profilometer has become a primary tool in quality control in leading plants throughout the country.

DETAILED ANSWERS to the above questions will be found in this illustrated bulletin, together with other facts of direct concern to production and quality control men. Write for a copy—and arrange to have the Profilometer demonstrated in your own plant. You may be surprised to learn how this instrument can cut your production time and costs.



The PROFILOMETER
TRADE NAME REGISTERED

PRC

PHYSICISTS RESEARCH COMPANY

ANN ARBOR • MICHIGAN

Quality Control

(*Continued from page* 35)

portant aid to the foundry specialists and metallurgists in setting the range for these variables.

Even in its early stages the project has created a minor revolution in inspection methods. Each department now has a centralized inspection center with a suitable bench and complete equipment for gaging. The general scheme is to check five pieces on each machine at unspecified intervals to assure random sampling. This group of five pieces is the "sample", and the average of the five readings constitutes one point on the control chart. The "sample" of five was chosen deliberately to reduce even simple arithmetic computation, since the value of the "average" or "X" representing a single point is obtained by adding the five values, then multiplying by 0.2. This eliminates the need for dividing the sum of five figures by five.

Another simplification is in the use of the actual tolerance limits on a given dimension or "attribute" in establishing the "limit" lines on the chart instead of resorting to the mathematical "root - mean - square" limit used by the statistician in determining control limits due to chance variations.

M-M has developed a new idea in control chart technique. Certain parts have two or more critical dimensions or "attributes" that require control. If a separate chart for each were used it would be necessary to consult from two to five charts. Consequently, all of the "attributes" of a single part are recorded on one chart, plotting the points in different colors and "codes" to distinguish one from another.

Quality control has been found to yield some very tangible results apart from production economy. In the first place, it is now practical to allocate responsibility for rejects and spoilage. That, in turn, makes it easier to localize the seat of the problem and find ways to eliminate trouble. There is another important point. Since the control chart has upper and lower limit lines the tool setter and operator now try for initial adjustments that will start the operation at the base of the low limit. Barring variations in material quality and hardness, only progressive tool wear will urge the pattern of readings to approach the upper limit of tolerance. By this means the tool set up is given considerably longer life.

By the same token, after some considerable experience, it should be possible to establish a criterion of tool life for each set up. That will make it possible to set an arbitrary limit on the useful life of a tool set up, in terms of hours or pieces, thus establishing the time for chang-

(*Turn to page* 68 *please*)

Tough Bolts for Rugged Work

These big, rugged bolts for heavy tractors, earth-moving equipment and heavy machinery are the "work horses" that handle unusually tough fastening jobs. Made from high carbon or alloy steel, with special heat-treatment, these bolts, when tightened, have extremely high resistance to stress, shear, fatigue and impact to prevent wear or breakage. They are made to perform hard tasks.

For special fastening jobs, "National" has designed and produced many special headed and threaded fasteners by the upset, cold headed process that have proved stronger and lowered costs. With its wide variety of manufacturing equipment used to make the most complete line of bolts, nuts, screws and other fasteners, "National" has the facilities to supply you with the right fasteners (large and small, standard or special) to make the products you manufacture fit better—stay tighter—or operate more smoothly.

National
PRODUCTS

THE NATIONAL SCREW & MFG. COMPANY, CLEVELAND 4, OHIO

ing tools. Although some tools may be broken down sooner than necessary the economy due to preventing spoilage should more than tip the balance.

Let us consider several specific examples. The Como Plant—which builds the new M-M Bale-O-Matic machines—has one of the most modernly equipped departments for machining pistons. Each of the machines—except for some roughing operations—is subject to quality control. A Heald double-end six-spindle Bore-Matic is used for finish-boring the piston pin holes. Each end of the machine has three spindles, and three pistons at a time are handled in the fixture. The machine cycle is arranged to bore three at one station, then the fixture is moved over to the other end for boring from the opposite side. The tolerance specified by the engineering department is plus or minus 0.0015 in. However, the inherent precision of the machine is such that the actual tolerance is more on the order of 0.0005 in. The control chart thus becomes a guide in watching the tooling as well as quality, and tool life can be extended at will within the limits specified.

Another interesting operation is the centerless grinding of piston skirts in the new Cincinnati centerless grinder. Because of the accuracy of the machine, surface finish is the major consideration. At M-M the surface finish is held at 25-microinch (rms) plus or minus 5-microinches. This finish is obtained by two passes through the machine, using an oil as the cutting fluid. Samples are checked by taking Profilometer readings.

An unusual feature of this machine is a return magazine feed attachment on the back end of the machine. As a piston is ejected it comes against a stop in the chute and the mechanism then propels it through the chute running over the top of the machine right into the hands of the operator. By eliminating manual handling, it enables a single operator to run the machine and store the work at the loading station.

The current modernization program contemplates a re-arrangement of equipment to facilitate the machining of related parts and to reduce manual handling to the minimum. Despite the relatively small size of the lots handled in this operation, the purely departmental arrangement of machinery is broken down and machines for certain related operations are grouped so as to enable a single operator to run two or more machines used on the same part.

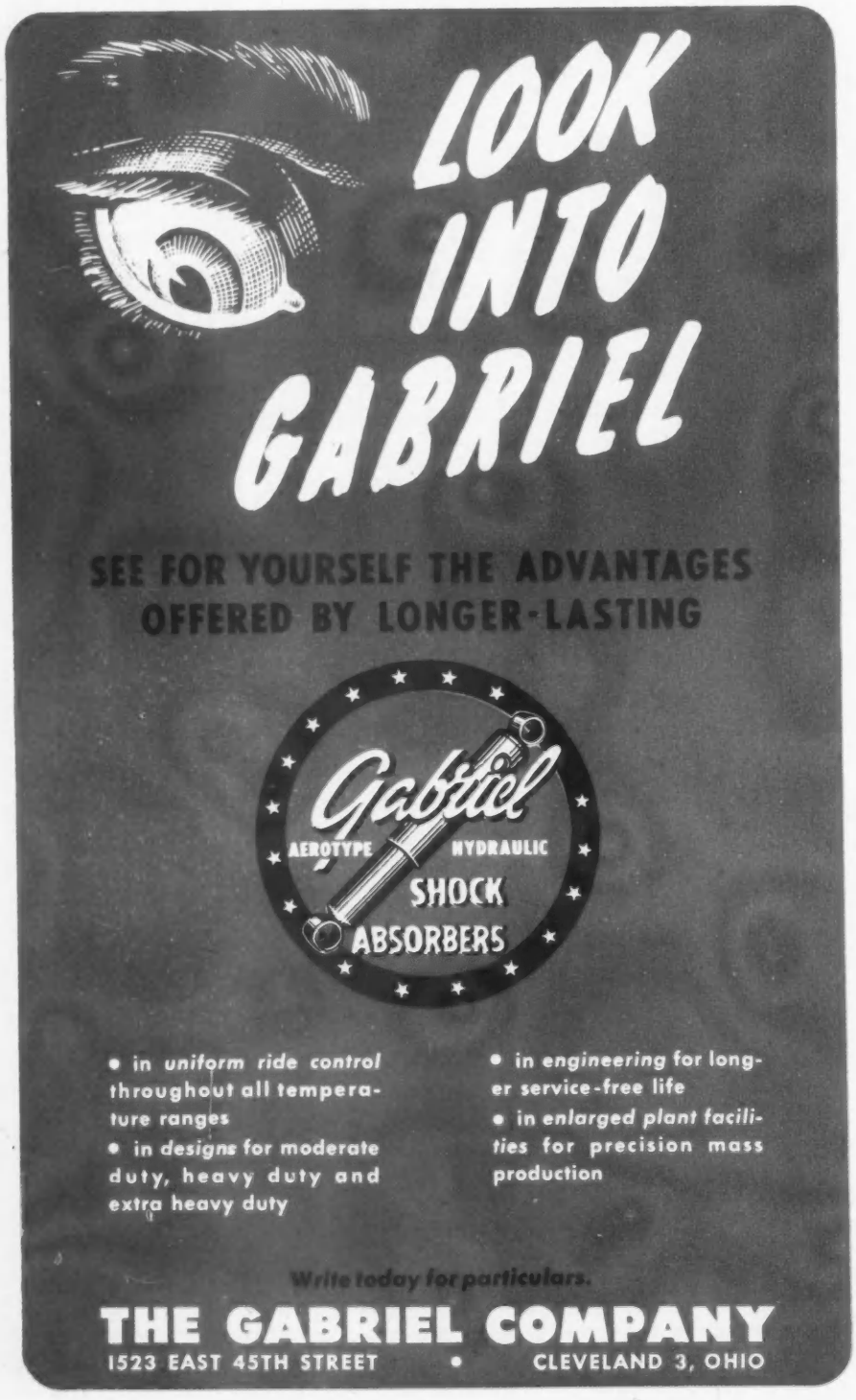
Recognizing the modern trend in cutting tool selection, M-M is making extensive use of cemented-carbides of suitable grades for all cast iron and steel cutting. Cemented-carbide tools are currently used for all milling, turning, and boring operations.

Several of the latest type General Electric electronic induction heating units have been installed for selective hardening of a great variety of parts. For the hardening of gear teeth of the bull ring gear, M-M has developed its own flame hardening machine using a group of Selas type gas burners at the hardening station and quenching at the other station. The cycle of events is automatically controlled.

The heat treating department, too, is undergoing major improvement. One of the latest of the Surface Combustion timed cycle continuous annealing furnaces of five-zone type is in operation, and a rotary type Surface Combustion hardening and quenching furnace.

M-M operates two self-contained foundries—one serving the tractor plant in Minneapolis, the other at Hopkins serving the farm implement division. Both foundries have been modernized to the fullest extent. They feature core blowing, mechanical molding machines, and conveyorization of high production molding lines. An interesting feature of cupola management is the adoption of continuous pouring, using a large capacity receiver at each cupola.

(*Turn to page 70 please*)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"GOOD OLD GAL—

You've served us well"

Good old, faithful Nellie. When she was "traded in for a new model" it wasn't without many a loving pat and well earned tribute from those she served so long and well.

And today, faithful old *"Mechanical Horses"* are getting many a parting tribute too. Through the long shortage years the motoring public has learned to recognize and respect real quality—the fact that it takes the real McCoy in *little* things to make that *big* difference in motor vehicle life and economical upkeep.

Take, for example, that vital clutch release job. That's where trustworthy Aetna T Type bearings serve veteran vehicles so faithfully. Designed with unique, patented features which make for reserve stamina and long life these superior bearings long ago proved themselves "Naturals" for tough times like these.

That's why leading car, truck and tractor manufacturers first standardized on Aetna Clutch Release Bearings —why they've never switched from them. They're ready and worthy for your vehicles too. May we send you a sample for test?

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Large capacity, beveled lubricant chamber insures constant circulation and life-long retention of lubricant.

T-shaped, sturdy, one-piece, oil-filled bronze ball separator maintains fixed alignment, provides the added smoothness and durability of steel to bronze contact.

Aetna

BALL AND ROLLER BEARINGS

The Minneapolis foundry has two merry-go-round molding and pouring lines, one of these being equipped with a six-station circulation molding table served by a sand slinger.

Details of the quality control system in the machine shop and for controlling metal are presented herewith:

OUTLINE OF QUALITY CONTROL FUNCTION IN THE SHOP

"1—The inspector will start charting readings with the setup piece. The first sample of 5 pieces will consist of the one piece from the setup and 4 pieces run immediately after the setup piece.

"2—When the control chart on job or operation indicates good quality of work, the inspector may release the load or lot to the Production Control expediter.

"3—When the control chart indicates questionable quality, the load or lot will be held for sampling by Inspection Department. This sampling technique will determine the per cent defective and extent defective, thereby recommending sorting out of defective parts, or if extent of the defect is not serious, release the load or lot to Production Control expediter.

"4—The cost of screening or sorting defective work will be charged to department producing the defective work, in the form of a variation.

"5—The foreman's attention will be called to any serious out of tolerance work indications immediately after plotting defective sample on Control Chart. In the event the subsequent Control Chart plottings show no improvement, the foreman will be given a written complaint concerning the out of tolerance work.

"If the Control Chart still shows out of tolerance work, the foreman will be given second notice with his name registered twice to indicate this is a second notice.

"When the Control Chart still shows out of tolerance work, a notice will be sent to the General Foreman with his foreman's name registered twice on notice to indicate his foreman's attention was called to the out of tolerance work a second time. Successive notices will be given to each step in management with Superintendent's office receiving the final notice.

"Always make three copies of this notice. Send one to foreman or person notified, one to the Quality Control Office, and keep one in inspector's file.

PROCEDURE FOR CONTROLLING METAL

"I **Properties to be Controlled**

1—**Chemical Analysis:** Carbon, silicon, phosphorus, sulphur, and manganese.

2—**Physical Properties:** Tensile strength, transverse strength, Brinell hardness, deflection and depth of chill.

3—**Temperatures:** Spout temperatures and start and finish pouring temperatures.

"II **The desired level and permissible range** of each of the metal properties to be determined by the Foundry Metallurgiist as approved by the Foundry Superintendent. These desired levels or maximum and/or minimum limits to be established as the working specifications for the metal, subject to periodic review and changes when shown advisable by casting results.

"III **Control Charts** will be drawn up by the Foundry Quality Control Technician using these given specifications to calculate the control limits.

"IV **Checks to be made:**

"1—**Carbon and Silicon:** Analysis to be made by the Chemical Lab on chilled shot or chill bars poured at the cupola and delivered to the lab **each hour** of operations, and the results reported to the Foundry by telephone as soon as possible. After each group of four readings (every four hours) the Quality Control Technician will calculate the average and range of the group and plot them currently on the Control Chart located at the cupola.

"2—**Physical Properties and Other Chemical Constituents of the Metal:** Analysis and physical tests to be made by the Chemical Lab on test bars, poured at the cupola four times a day at specified intervals during the days operation, and reported to the Foundry on Lab Report forms. The Quality Control Technician will plot the average and range of the properties currently on charts to be kept in the Foundry office.

"3—**Pouring Temperatures:** Hourly checks to be made on the starting and finishing pouring temperature of one ladle of metal at each molding unit by the Temperature Checker, who will record the readings on Pouring Temperature Sheets provided for this purpose. After each group of four readings (every four hours) the temperature checker will calculate the average and range and plot them on Control Charts located at Pouring Stations.

"4—**Melting Temperatures:** Half-hourly readings to be taken on the temperatures of the metal at the spout by the temperature checker and recorded on Temperature Check sheets provided for this purpose. After each four readings (every two hours), the Temperature Checker will calculate the average and range of these readings and plot them on the Control Chart located at the cupola.

"5—**Chill Bars:** Quarter-hourly chill bars to be poured at the cupola by the Lead Pour-Off Man and the depth of chill recorded by him on the Cupola Operation sheets. After each four readings (every hour), he will calculate the average and range of these readings and plot them on the Control Chart located at the cupola.

"V **When the Control Charts** for these metal properties show that they are operating within specifications, no changes in methods or mixtures will be made unless authorized by Foundry Superintendent.

"VI **If the Control Charts show that any one of these metal properties is not being held** within the specified limits, the individual responsible for plotting that particular Control Chart will first verbally and then in writing, if subsequent plottings continue to fall outside limits, notify the person responsible for holding this property within specifications.

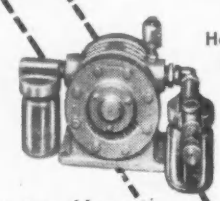
"VII **If the Control Charts still fail to show improvement** successive written notices of this condition will be given first to the Foundry Metallurgist and then the Foundry Superintendent.

A PRINTING PRESS PROBLEM:

Vacuum and Pressure Both—

SOLVED WITH *Visioneering** + ONE Gast ROTARY PUMP!

*Visioneering—Broad vision plus engineering skill.

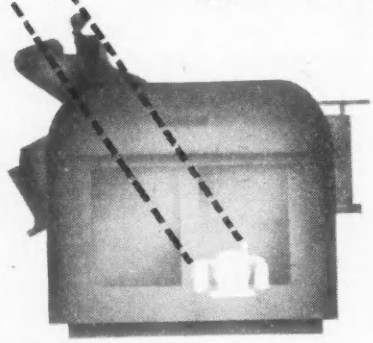


GAST ROTARY
AIR MOTORS to 1 h. p.
COMPRESSORS to 30 lbs.
VACUUM PUMPS to 28 in.

Here's Visioneering applied—by designers of a high-speed printing press! With both vacuum and pressure, the press feeds up to 4,000 sheets per hour. ONE Gast Rotary Air Pump does it with ¼ H. P. Air volume of 7 C. F. M. results at only 950 R. P. M. Gast Rotary Design with 4 plastic vanes is quiet, cool-running . . . has been standard equipment since 1940.

Gast Units solve original equipment problems on totally *unlike* applications ranging from A to Z. So here's an invitation to you, the Visioneer, to consider how "Air may be your Answer". Gast Rotary Vacuum Pumps, Compressors or explosion-proof Air Motors provide *improved product efficiency—reduced bulk—increased safety—"pulseless" performance*—and other advantages.

Using this example of present Gast Applications, direct your own visioneering skill to your original equipment problems. We'll be glad to cooperate if *air* pressure, vacuum, or power can be applied on your products. For details, write Gast, describing your problem.



LOOK AT THE RANGE OF APPLICATIONS:

VACUUM PUMPS to 28 in.	Paper feeding on printing presses Drawing liquid on milk samplers Dry vacuum for coolant sump cleaners Vacuum chuck on high-speed lathes
AIR COMPRESSORS to 30 lbs.	Fuel atomizing on oil burners Air for dry-powder spray guns Aeration for dry bulk concrete Pressure for edible fat filtering
AIR MOTORS to 1 H. P.	Explosion-proof drive for agitation of chemicals, plastics, paint Self-regulating, variable-speed drive for conveyor belt

Air may be your Answer!

MOST DELIVERIES MADE FROM STOCK

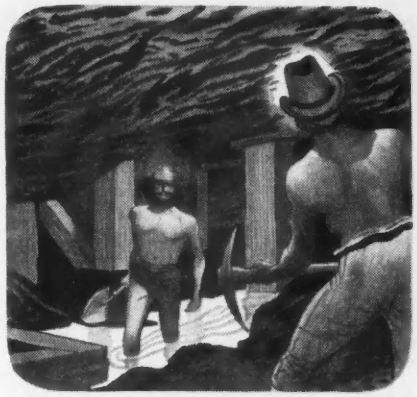
WRITE TODAY! Request your copy of this IDEA-CATALOG.

GAST ROTARY AIR MOTORS COMPRESSORS VACUUM PUMPS

GAST MANUFACTURING CORP.

129 Hinkley Street, Benton Harbor, Michigan

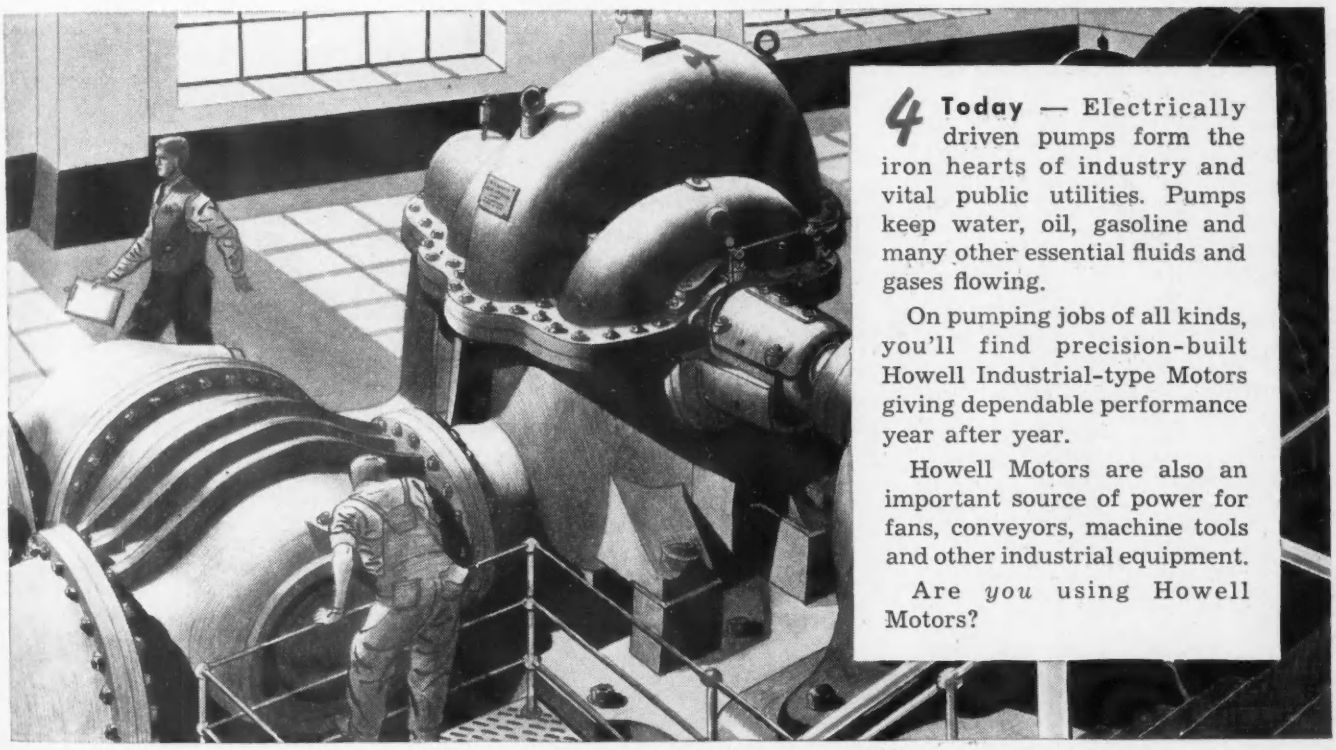
1 **1643**—Torricelli, Italian physicist, hastened the development of modern hydraulic pumps when he found water could be raised in a tube by air pressure.



2 **1840**—Steam pump engines were helping to keep water out of mines. But low-cost electricity which put the *big* push behind pumping was still to come.

3 **1915**—Howell "Red Band" Electric Motors were introduced. Soon, these rugged, industrial-type motors gained wide recognition in this and other industries.

PUMPS . . . IRON HEARTS OF INDUSTRY!



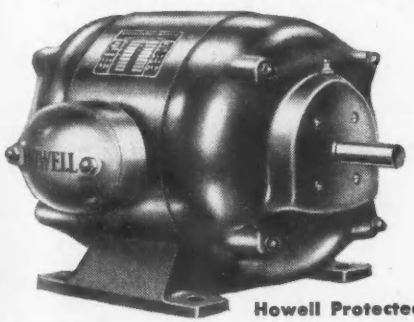
4 **Today** — Electrically driven pumps form the iron hearts of industry and vital public utilities. Pumps keep water, oil, gasoline and many other essential fluids and gases flowing.

On pumping jobs of all kinds, you'll find precision-built Howell Industrial-type Motors giving dependable performance year after year.

Howell Motors are also an important source of power for fans, conveyors, machine tools and other industrial equipment.

Are *you* using Howell Motors?

Here's another precision-built Howell Motor . . . industrial type with copper or bronze bar rotors . . . specially insulated . . . statically and dynamically balanced.



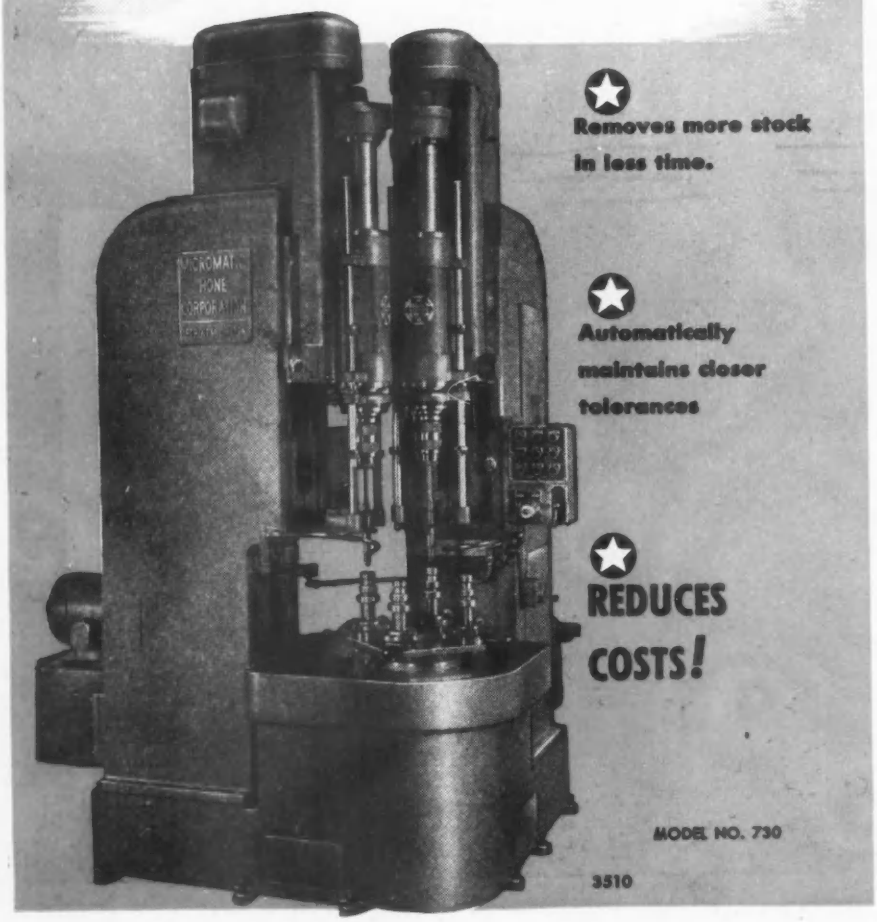
Howell Protected Type Motors

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Manufacturers of Quality Industrial Type Motors Since 1915

MEMO
Lets look into this
machine
for heavy-duty multiple
or progressive
MICROHONING



Removes more stock in less time.

Automatically maintains closer tolerances

REDUCES COSTS!

Micromatic now offers a new multiple spindle, unit constructed, Quill type machine with added power and control for removing more and more stock in less time from harder materials. Completely automatic, electronic control of uniform size within .0001 to .0003 inch in production.

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Micromold Manufacturing Div.
Boston Post Road
Guilford, Conn.

War Built Plants

(*Continued from page* 56)

partially authorized through executive orders and directives, legislation is now pending to make the whole a continuing program by statute. Included in the new list of surplus plants which are to be made subject to the security provisions before disposal are the following:

Aviation Facilities—Curtis-Wright Corp., Kenmore, N. Y.; Republic Aircraft Products Division, Detroit; Solar Aircraft Co., Des Moines; Waco Aircraft Co., Troy, Ohio; Fairchild Engine & Aircraft Corp., Jacksonville, Fla.; Wright Aeronautical Co., Paterson, N. J.; Aircraft Service Corp., Valley Stream, Long Island; Northwestern Aeronautical Corp., St. Paul; Bendix Aviation Corp., (Plants 2 and 4), South Bend (Plancor 132), Teterboro, N. J., and (Plancor 171) at South Bend; and, McDonnel Aircraft Corp., Memphis.

Oil and Refining: Standard Oil Co. plants (Plancor 1065, 1526 and 1868), Baton Rouge; Mohawk Petroleum, Bakersfield, Calif.; and, Wilshore Oil Co., Norwalk, Calif.

Automobiles and Parts: General Motors Corp., (NObs 1599), Kings Mills, Ohio; Studebaker Corp., Chicago; Willys Overland (Plancor 383), Toledo; and, Timken Roller Bearing Company, Columbus.

Rubber: Goodyear Synthetic Rubber Corporation (Plancor 126), Akron; and U. S. Rubber Company (Plancor 611-A), Los Angeles.

Hidden Payroll Costs

(*Continued from page* 33)

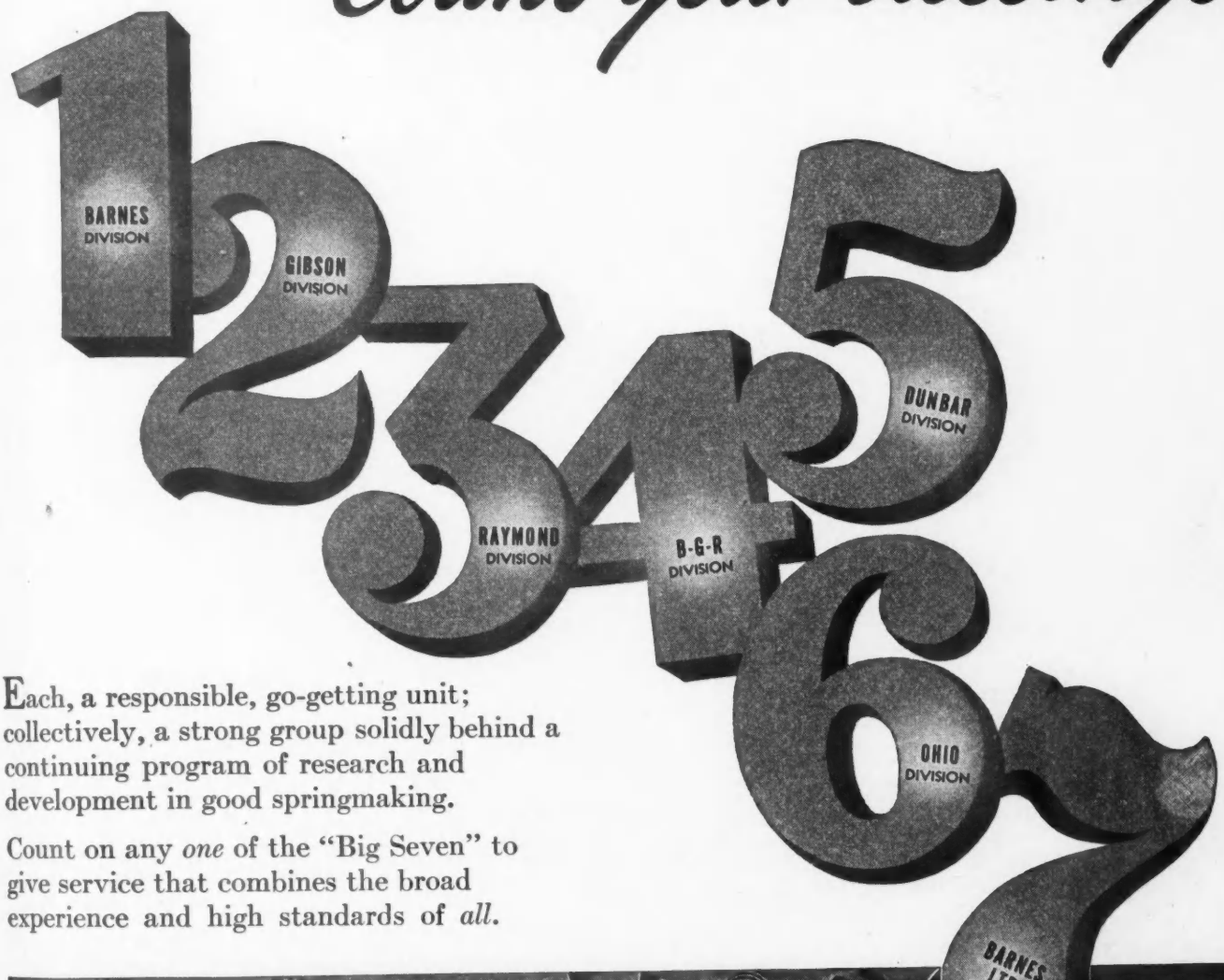
and other states west of Ohio these "hidden payrolls" amounted to 12.219 cents per hour while at 17 parts manufacturing plants in New York, Pennsylvania and other states east of Ohio the costs per hour were 12.860 cents.

All of these data were gathered and compiled by the Automotive & Aviation Parts Manufacturers, Inc. and according to their statement can be considered as very conservative. For example, paid lunch periods were not considered in these calculations nor were paid rest periods. While the latter are not supposed to be a cost to production many employers are inclined to believe the rest periods are badly abused. Insurance costs were very difficult to segregate as between salaried and hourly employes, so in many cases these insurance figures were not included in the collateral payments over and above hourly wages.

In the table shown here the Automotive & Aviation Parts Manufacturers, Inc. have summarized the reports of the 163 companies operating 198 parts plants as to the various types of "fringe" payments and the cost to the companies for each man-hour worked.

NEED SPRINGS?

Count your blessings



Each, a responsible, go-getting unit; collectively, a strong group solidly behind a continuing program of research and development in good springmaking.

Count on any *one* of the "Big Seven" to give service that combines the broad experience and high standards of *all*.

ORIGINAL DIVISIONS OF ASSOCIATED SPRING CORPORATION
WALLACE BARNES COMPANY
BRISTOL, CONNECTICUT
THE WILLIAM D. GIBSON COMPANY
1800 CLYBOURN AVE. CHICAGO 14,
RAYMOND Manufacturing COMPANY
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BARNES-GIBSON-RAYMOND
6400 MILLER AVE., DETROIT 11, and ANN ARBOR, MICH.
.... AND DUNBAR BROTHERS COMPANY DIVISION, BRISTOL, CONN.
OHIO DIVISION, 1712 EAST FIRST STREET, DAYTON, OHIO
IN CANADA, THE WALLACE BARNES CO., LTD., HAMILTON, ONT.

The Walking Barge

(*Continued from page 27*)

For travel in water, a power take-off from the engine drives a propeller located in the stern of the inboard pontoon. This propeller-and-drive arrangement is designed so that the propeller can operate at various angles, and when not in use it is housed in a well, out of the way for land travel. When entering water, the barge walks out as far as possible before the propeller takes over. To make a landing, the barge is driven as far as possible onto the beach with the propeller and then it is walked ashore.

The first working model, designed by the author while a Lieutenant Commander in the Navy, was built at Pearl Harbor near the end of the war. It was constructed of ordinary Navy lighter pontoons and powered by a HD-14 Allis Chalmers tractor set in the inboard pontoon. This model was copied from a scale model with which preliminary tests were conducted in much puddles made for the purpose.

The idea of constructing a machine or device to successfully traverse mud flats, swamps, and unstable ground was conceived early in the 1920's. While a student at the University of California at Berkeley, the writer traveled extensively throughout the San Francisco Bay region and the Sacramento River Valley. During these trips, it was noted that the various methods used in constructing drainage ditches, laying pipe lines, constructing foundations for high-tension power-line towers, arranging discharge pipes from hydraulic dredges for placing hydraulic fill, dredging operations, driving piling along river fronts for bridges and piers, repairing dikes and revetments, and other operations.

The inventor particularly noted that in traversing unstable ground, draglines, shovels, pile-driving equipment and ditching machinery utilized large pads or mats made of heavy timbers which could be lifted into place by a crane; and, after the equipment had rolled forward, the pads or mats lying behind the crane or shovel would be picked up, swung around, and laid out in front of the equipment. Often the bearing value of the pads would be insufficient or the equipment would slide off resulting in costly salvage operations which had to be carried on in the mud. It was noted also that in some areas pipe and sewage lines, power and other utilities lines appeared to have been laid in circuitous routes across tidal and swampy lands for the reason that it was cheaper and took less time to go the long way around rather than attempt to directly cross the unstable ground.

In all of these operations it was evident much time and money were expended in order to get the equipment into the place to do the job. If an operation proved too costly, the area was entirely circumvented. This extra work and expenditure and, in some instances, the actual by-passing of areas, was due primarily to lack of equipment having an extremely low bearing pressure on the ground coupled with amphibious features for use in swampy or tidal lands. The need for a machine of this type was obvious, and it was during this period that the principle of the "walking beam" was conceived.

The application of the "walking beam" principle to vehicles, boats and barges was worked out in 1937 and 1938, and since that time the inventor has constructed several small working models of the basic device, including many adaptations. Tests of the "walking barge" are being continued at the Advanced Base Proving Ground, Port Hueneme, the test and development center for the U. S. Navy Bureau of Yards and Docks.

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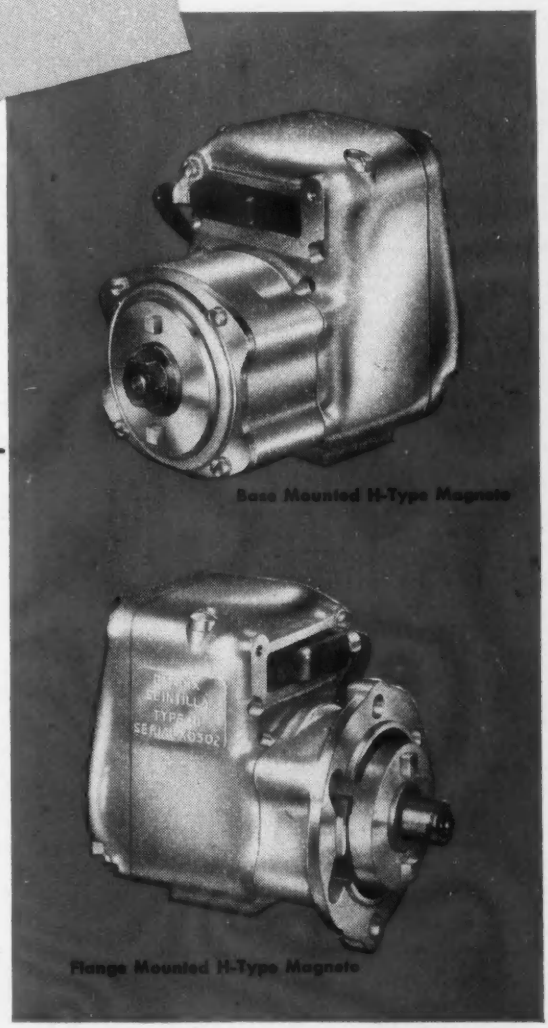

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Flange Mounted H-Type Magneto

For Commercial, Industrial and Marine Applications

Bendix-Scintilla, long famous for ignition equipment precision-built to the exacting specifications of the aviation industry, now brings you these same high standards of quality and efficiency in a new H-Type Magneto for single cylinder engines. This unit has been developed by Bendix-Scintilla engineers, after extensive study of the field, as a completely new magneto —with new design features—new sure-fire performance. For the improvements you expect, specify Bendix-Scintilla* H-Type Magnetos, backed by years of experience in dependable ignition for every type of engine. Ask your distributor or write the factory for full specifications and information.

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SIDNEY, NEW YORK

Only PHILLIPS

RECESSED HEAD SCREWS

have driver sizes engineered in balance with ALL screw sizes for PRACTICAL PRODUCTION DRIVING

Phillips Practical Engineering, based on exhaustive tests of actual driver requirements on the assembly job, proved 4 sizes of recesses and drivers the fewest possible for dependable efficiency in driving the complete range of sizes of cross recessed head screws.

One Driver Size is adequate for most jobs, however, because the great majority of production assemblies use screws in the Phillips No. 2 recess and driver size range.

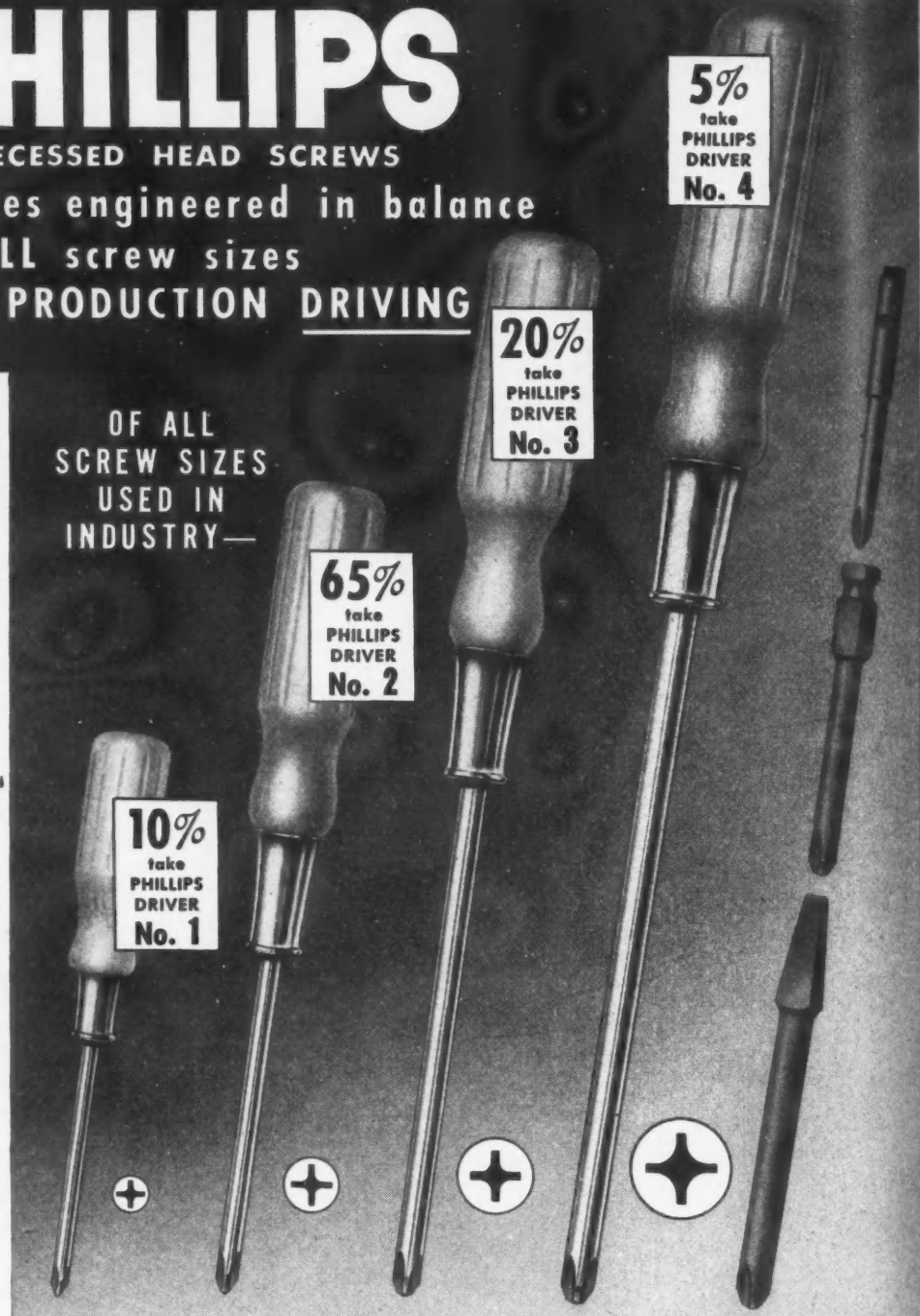
About 25% of Screws used in production assemblies are bigger than those in the popular No. 2 size range. 20% have Phillips No. 3 size recess, and the proper balance essential to efficient driving is provided by the Phillips No. 3 size driver.

For the Few Heavy Duty screws used, (5%), you need a driver and recess size balanced to obtain the required torque and fastening security, — Phillips No. 4. Using a driver suited to smaller screws is like using a tack hammer on a railroad spike.

For Small Size Screws, you want a small driver (No. 1) in proper *balance* to prevent overdriving, stripping threads, or straining screw head. You wouldn't use a driver big enough to drive a ½" diameter screw, any more than you'd use a sledge hammer to drive a tack.

Phillips Screws not only promise, but *deliver* all the advantages of cross recessed head screws. Ask for Phillips when you order.

OF ALL SCREW SIZES USED IN INDUSTRY—



DRIVERS AND BITS SHOWN HALF SIZE — RECESSES ACTUAL SIZE

THE PHILLIPS DRIVER AND SCREW are in perfect balance, whatever the size. Less than 4 recess and driver sizes would have meant weakened heads in some screw sizes — would have encouraged overdriving to weaken the screw, or underdriving to lessen assembly strength.

By varying the length and diameter, the same balance is assured in bits for hand brace, spiral, and power driving.

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Send me the new booklet—"How to Select Recessed Head Screws for Practical Production Driving".

AA-28

Name.....

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Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

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Gas Turbines for Automobiles

(*Continued from page* 31)

The elimination of gear changes and variable speed transmissions makes the gas turbine a most desirable unit. The turbine speed at maximum road speed would be of the order of 20,000 or 30,000 rpm, and a set of planetary gears would be required. Reversing would be accomplished by a reversing gear.

Control of the simple turbine requires only a throttle valve on the fuel line to govern the combustion temperature. With the use of a separate power turbine the fuel regulation to two combustion chambers or a single combustion chamber and control of a bypass valve must be designed to operate dependently upon each other.

Several high temperature alloys are available for blade materials. If a vehicle is expected to run 100,000 miles and the average speed is 40 mph, the life would be 2500 hr. Alloys having one tenth per cent creep in 3000 hr under a stress of 30,000 psi at 1350 F are available at present. There is still a good chance that the metallurgists will develop better alloys. New metals are being experimented with, ceramic coating and even ceramic blades offer new possibilities.

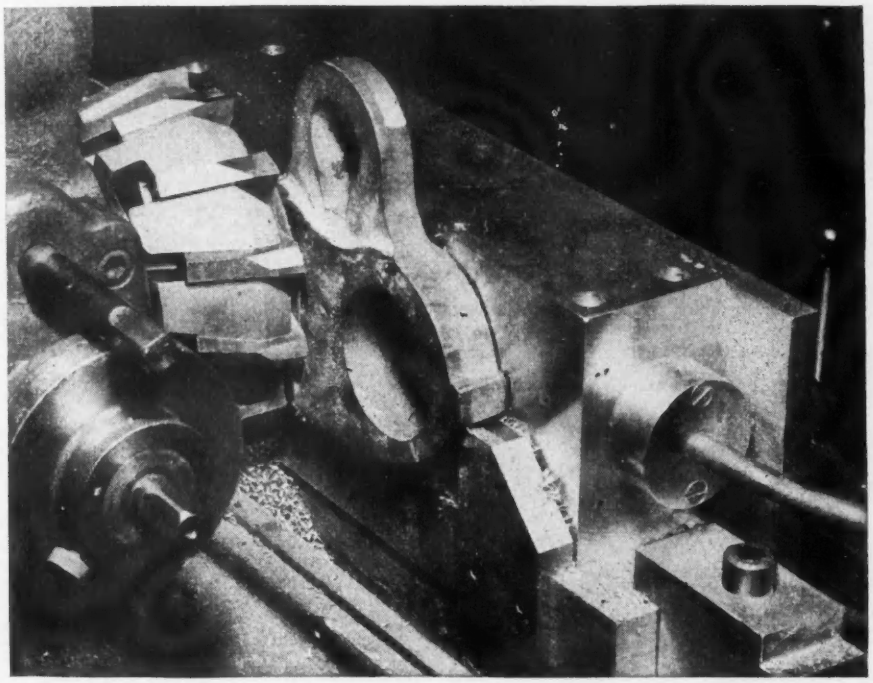
The gas turbine is not temperamental toward the fuel it burns. Poor quality of fuel oils can be burned successfully and much development work is being undertaken in the use of powdered coal. The specific fuel consumption of the gas turbine at full load with a 1600 F combustion temperature would be about 0.65 lb per hp-hr, rising to 0.9 lb per hp-hr at half load.

There are certain losses inherent in the gas turbine. These are nozzle friction and shock, blade friction, windage of the high speed turbine wheel, incorrect flow angle at speeds and loads other than design conditions and turbine leaving losses. With good design the nozzle and blade losses may be kept small. With small power output high speeds are inevitable. The high speed leads to a small compact unit, but windage losses increase as the cube of the speed and become appreciable at 20,000 rpm. In order that blade lengths and therefore centrifugal stress in the blades be kept within allowable stress loadings, the axial velocity through the blades cannot be negligible.

Gas turbines for highway transportation will probably be the last application to be developed. Much depends on what the future fuel situation will be and the development of more efficient compressors and turbines and the possibilities of using higher temperatures. With the present differential between furnace oil and Diesel fuel and with a Diesel lubrication cost of 10 per cent of the Diesel fuel cost, a gas turbine having an efficiency of 24 per cent is equivalent in operating costs with a Diesel having an efficiency of 36 per cent. The first cost of the gas turbine would be about 75 per cent of the cost of a Diesel and would have the advantage of excellent torque characteristic. The gas turbine without regeneration would require compressor and turbine efficiencies of 85 per cent and a turbine inlet temperature of 1500 F to have an overall efficiency of 24 per cent. These efficiencies are attainable in large units and it remains to be seen whether they can be attained in units of less than 1000 hp. Future developments will be watched with interest by the automobile engineer.

Better high temperature alloys, better compressor and turbine efficiencies, the use of powdered coal, the

(*Turn to page* 80, *please*)



Loading Time Reduced to an Instant Milling Castings with Power-Grip Holding

Illustration shows Power-Grip Chuck holding rough cast iron casting for milling. Cut is ⅛" deep, with 6" dia. Carbide tipped face milling cutter at 272 r.p.m., and feed at 16" per minute.

Power-Grip Chucks are an easy solution to many problems of holding castings. Simple, inexpensive adaptors can be made for castings of odd shapes and sizes. Work is set in accurate position, ready for milling, instantaneously. Reducing loading and unloading time to the extreme minimum means eliminating the major portion of the cost of most milling jobs, and with Power-Grip Chucks this can be realized quickly.

You can learn the possibilities for any job by sending us prints and operating data, so we can submit a complete proposal for Power-Grip Holding.

ROCKFORD MAGNETIC PRODUCTS CO., INC.

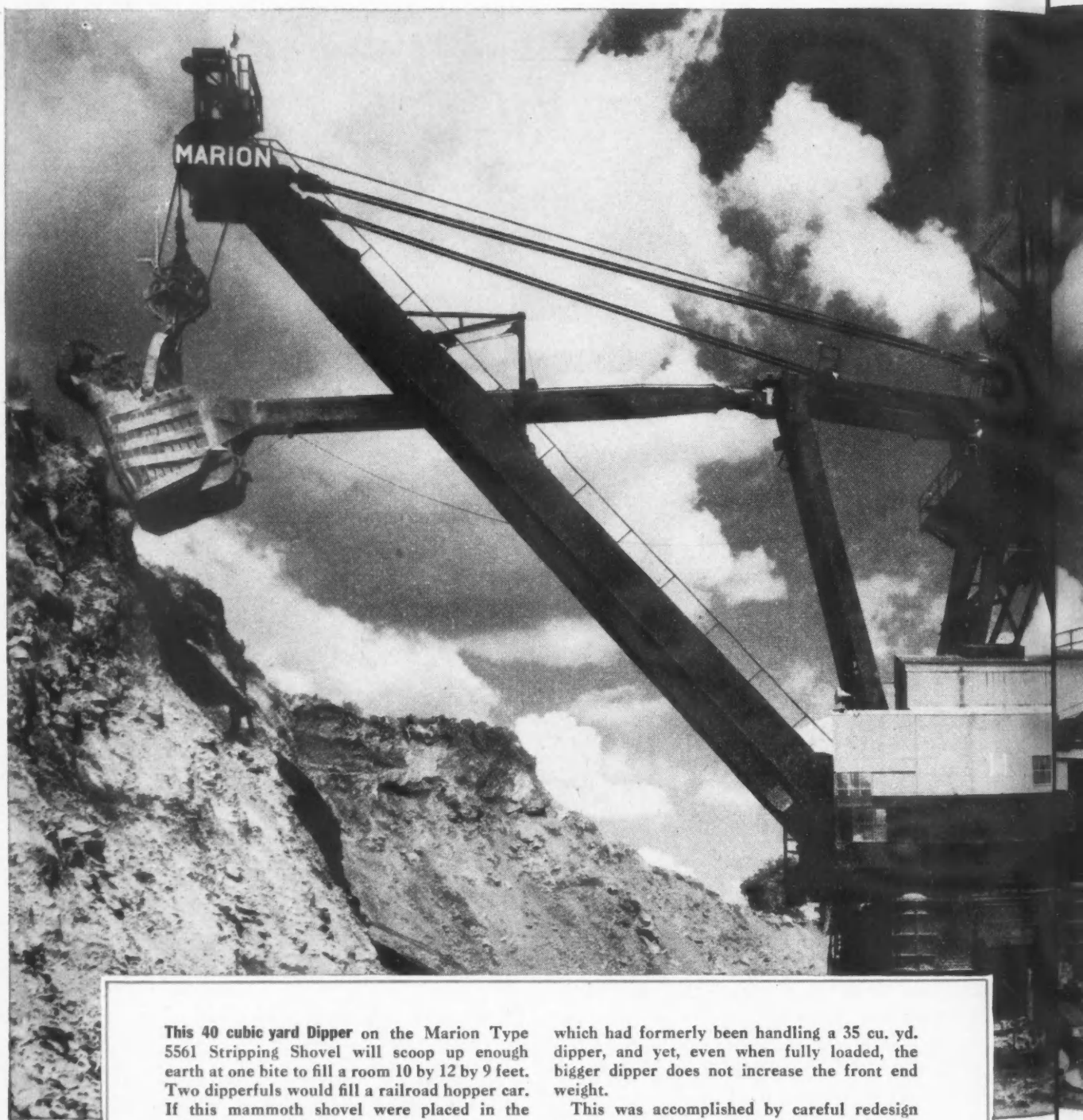
1314 18th Avenue, Rockford, Illinois

Send for This Booklet

ROCKFORD POWER-GRIP CHUCKS

Take a tip from the

when your construction



This 40 cubic yard Dipper on the Marion Type 5561 Stripping Shovel will scoop up enough earth at one bite to fill a room 10 by 12 by 9 feet. Two dipperfuls would fill a railroad hopper car. If this mammoth shovel were placed in the middle of a typical city block it could reach over into the next block and dump its enormous load on top of a 7-story building.

What is even more amazing is the fact that this 40 cu. yd. dipper was installed on a machine which had formerly been handling a 35 cu. yd. dipper, and yet, even when fully loaded, the bigger dipper does not increase the front end weight.

This was accomplished by careful redesign and the use of new steels of unusually high strength which cleared the way for a dipper and handle design which is 30,000 lb. lighter than materials formerly used in achieving the same strength.

World's Biggest Dipper

requires strength far beyond the ordinary

New, superior-strength alloy steel—tough and readily welded—reduces weight of dipper and handle 30,000 lb. . . . and makes possible a 14% increase in shovel output.

IF you are interested in the possibilities offered by *readily welded* steel plates that have far greater strength and toughness than low-alloy, hot-rolled steels, this story is for you.

Four years ago the engineers of the Marion Power Shovel Company came to us. They had a real problem. They were called upon to design and build a coal stripping shovel of greater capacity than the 35 cu. yd. size—largest in existence at the time—without increasing the front-end weight. What they wanted to know was: could we give them a steel that would have strength considerably beyond that available in the low-alloy, hot-rolled steels?—could it be welded and fabricated by conventional means?—could it be furnished in large plates?—could its cost be kept within economically practical limits?

The answer was "yes." After considerable research and testing, a copper-nickel-molybdenum steel that had been developed for gun mounts during the war was modified to fit the job. This steel has consistently shown a yield point in excess of 80,000 psi and tensile strength in excess of 100,000 psi, and has shown excellent weldability. In addition it has high impact strength, even at sub-zero temperatures. These properties lent themselves readily to Marion design, gave them almost 50% greater strength than obtainable formerly.

The steel was furnished in *heat-treated* plates, ¾" and 1¼" x 64" x 200". Used in the dipper handle in two U-shaped formed sections welded down the center of the sides, it reduced handle weight 25.5%. It was also used in sides and back of the dipper itself, which, although it is 14% larger than the former 35 cu. yd. dipper, weighs 10% less. The steel performed so successfully that it is now being used in *complete* dippers from 10 to 40 cu. yd. capacity.

We have gone into detail on this job because it so aptly illustrates two things:—first, the specialized metallurgical alertness and "know-how" that we can bring to any problem involving the use of alloy steels. And, second, our unequalled mill facilities for rolling, finishing and heat-treating that make it possible for us to supply alloy steel plates, in any analysis—in any size—in any heat treatment, to meet your requirements no matter how exacting. If your job demands the unusual in strength, abrasion resistance, durability, stamina, forming qualities—put it up to Carilloy Research.

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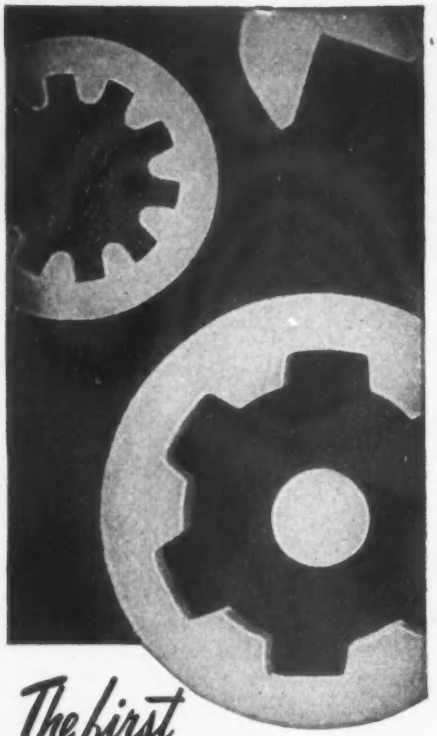
Carilloy Steels

USS

ELECTRIC FURNACE OR OPEN HEARTH

COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

UNITED STATES STEEL



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PRECISION CUT FELT PARTS

use or cooled blades and improved methods of manufacture will all have an important bearing on when and to what extent gas turbines will operate on highways. Simplicity can be the very essence of gas turbines. Only one or two rotating elements are needed. Centrifugal compresors with shrouded blades have already been successfully cast in one piece in the U. S. and at least one successful turbine wheel with blades has been cast in England. The mass production of gas turbines would be enormously simplified with proper casting techniques and even with milled compressors and separately formed blades, the manufacture of gas turbines is simpler than the production of reciprocating engines.

In the perhaps distant future it may not be too much to hope for a single rotating wheel in which compression, combustion and expansion take place with high efficiency. This would be the ne plus ultra of simplicity.

A successful gas turbine for vehicles does not sound the death knell for the reciprocating internal combustion engine. It will spur on improvements in both the spark ignition and compression ignition engines. There will always be a field of application which can be better served by reciprocating engines than gas turbines. Very likely the Diesel engine will receive more competition from the gas turbine than the spark ignition engine.

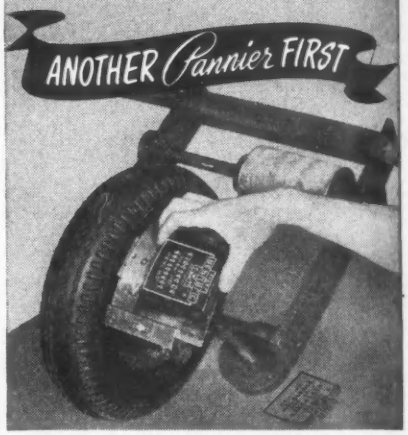
CALENDAR

Conventions and Meetings

Amer. Soc. Mech. Engineers Semi-Annual Mtg., Milwaukee	May 31-June 5
32nd International 500-Mile Race, Indianapolis	May 31
SAE Summer Mtg., French Lick Springs	June 6–11
American Electroplaters' Society Annual Convention, Atlantic City	June 28–July 1
Amer. Roadbuilders' Assoc. Road Show Chicago	July 16–24
Nat'l. Auto. Access. Assoc., Convention & Show, Chicago	Aug. 9–12
SAE West Coast Mtg., San Francisco	Aug. 18–20
Natl. Air Races, Cleveland	Sept. 4–6
SAE Tractor & Diesel Eng. Mtg., Milwaukee	Sept. 7–9
Instrument Soc. of Amer., Natl. Instrument Conf. & Exhibition, Philadelphia	Sept. 13–17
Turin (Italy) Auto Show	Sept. 15–26
Commercial Motor Transport Show, London	Oct. 1–9
SAE Aeronautic & Aircraft Eng. Display, Los Angeles	Oct. 6–9
Paris Auto Show	Oct. 7–12
Inst. of Traffic Engineers Annual Mtg., Phila.	Oct. 11–13
SAE Production Mtg., Cleveland	Oct. 21–22
London Passenger Car Show	Oct. 27–Nov. 6
Society of Motor Mfrs. International Motor Exhibition, London	Oct. 28–Nov. 6
SAE Fuels & Lubricants Mtg., Tulsa	Nov. 4–5
Automotive Service Industries Show, Navy Pier, Chicago	Dec. 6–10
SAE Annual Mtg., Detroit	Jan. 10–14
Natl. Auto Dealers Assoc. Convention & Equip. Exhibit, San Francisco.	Jan. 24–27

Print up to 2000 feet per minute with the
NEW Pannier AUTOMATIC SHEET and STRIP "Master Marker"*
...make complete die change in 30 seconds!

Pannier Engineers, through constant research and experimentation, have successfully developed a marking device for efficiently and automatically printing sheets and strip made from any kind of material.



CHECK THESE MONEY-SAVING ADVANTAGES:

- Prints *all* materials—any thickness.
- Driven by product or conveyor at production-line speed—up to 2000 feet per minute with safety. (Wheel need not ride on product.)
- Complete brass-back die held by spring pin—quickly and easily changed.
- Interchangeable Dovetail National Type for heat numbers, etc.
- One or two dies—any spacing required.
- Felt ink roll with enclosed bearings—inked from face—adjustable to die thickness.
- Adjustable-set-screw-collar crossbar mounting.
- Adjustable die pressure—remains constant despite product irregularities.
- Full counterweight on drive wheel axle for perfect balance.
- Friction drive, Alemite-lubricated-roller-bearing wheel with 30-35,000-mile-life rubber tire.
- Fully guaranteed. **Pat applied for*

Write for Bulletin ASS-1 which gives detailed specifications and prices. Pannier is a specialist in the design, engineering and manufacture of *all* types of marking equipment. Write us your needs.

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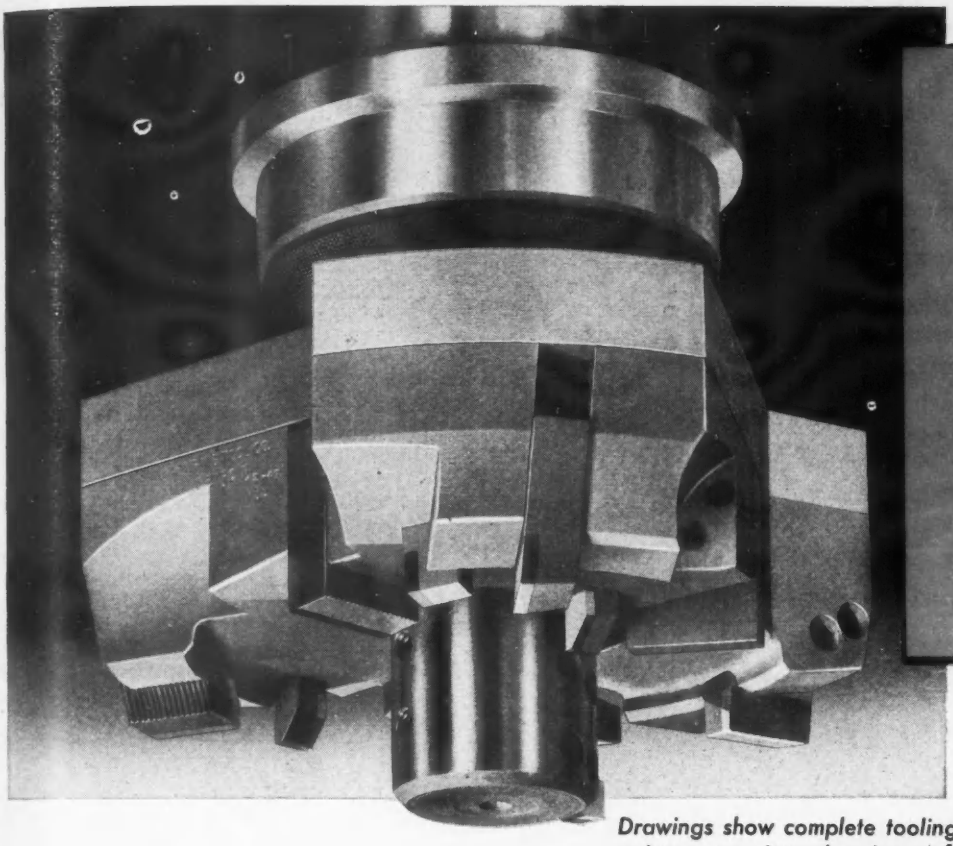
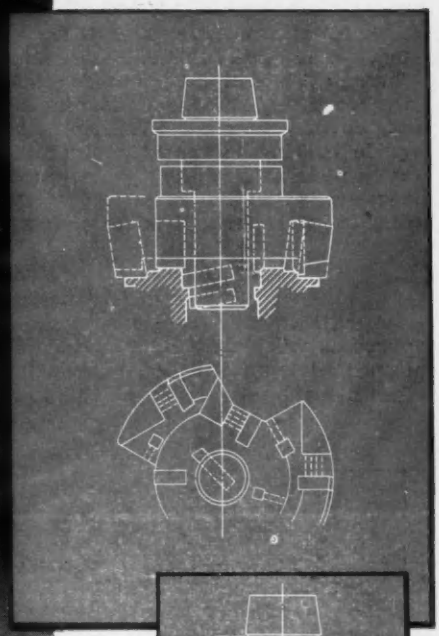
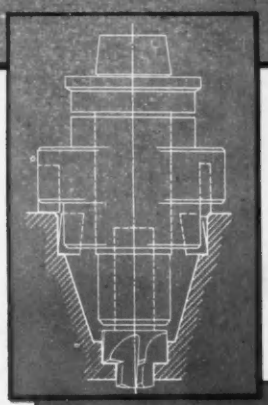
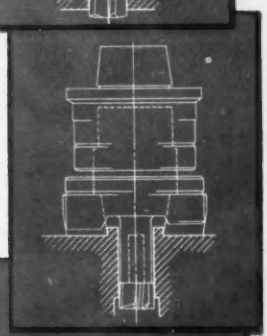
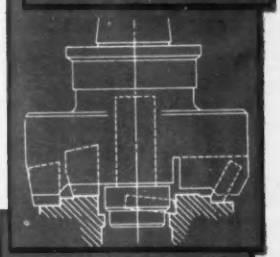










Drawings show complete tooling for a two-way, trunnion-type, four-spindle, roughing and precision boring machine, producing power take-off units. Each tool performs one or more operations such as boring, counterboring, chamfering, facing, and hollow milling.

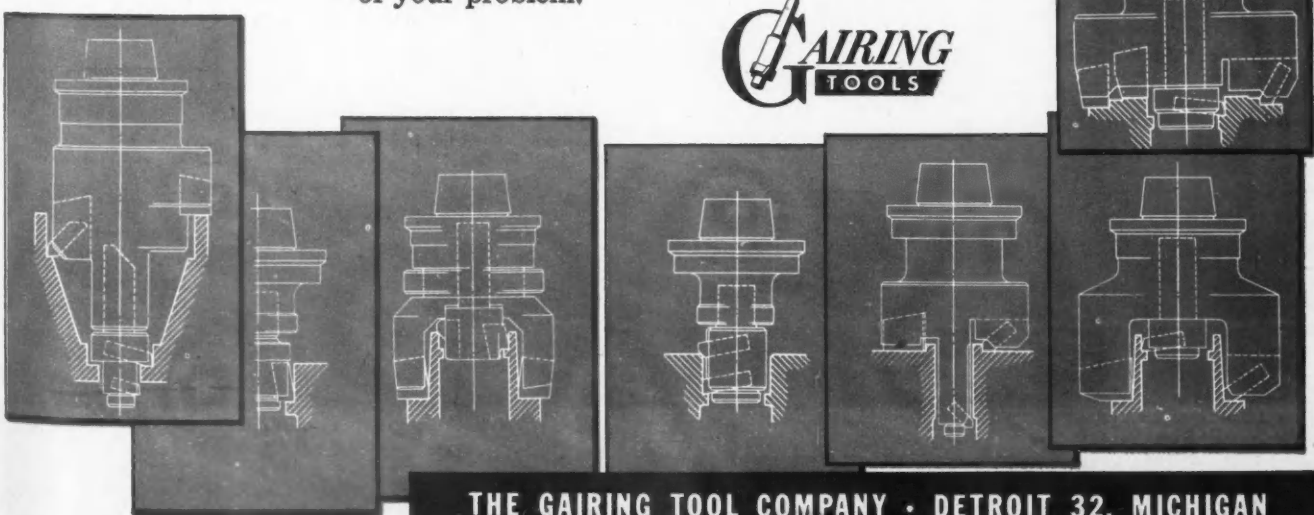
Multiple Tooling

More precision parts at lower costs are made possible through specially designed inserted blade cutting tools.

This actual example of multiple tooling recently completed by GAIRING suggests how the use of sound and proven principles of cutting tool design might improve the production of *your* machines.

So, if your present production falls short of expectations, let GAIRING's engineers make a comprehensive analysis of your problem.

GAIRING TOOLS



THE GAIRING TOOL COMPANY · DETROIT 32, MICHIGAN

Carbide-Tipped Drills

(*Continued from page* 45)

ing. The drill should be guided through the bushings and fed into the work while the work is rotating at cutting speed. The revolving guide bushing is forced against the work piece under spring pressure and revolves with the work. After the drill is in the hole, it is self-guiding.

Cutting Fluids

A cutting fluid serves four main purposes when used with a carbide-tipped all-depth drill. It removes the drill chips, lubricates the wear strips, lubricates the cut, and acts as a coolant.

Removal of the drill chips is a most important factor. The fluid, forced under high pressure through the entire length of the drill, washes the chips through the drill flute to the open end of the drilled hole and so into the chip duct.

The oil pressure should be high enough to keep the chips flowing continuously away from the cut. Working range of oil pressures for various jobs varies between 300 and 800 psi. The oil pressure for a given job varies with the drill size, depth of the drilled hole, and rate of feed. If the chip flow becomes intermittent, or if the chips coming out of the drill are packed together in a shape conforming to the drill flute cross section, this is usually an indication that the oil flow is too low.

Cutting Speed

Carbide drilling experience on steel indicates that the work being drilled should be rotated at an rpm which will give a cutting speed, at the outside diameter of the drill, ranging between 130 and 350 sfpm. It is suggested that a new job be started at from 200 to 250 sfpm and the speed varied until a satisfactory balance between drill life and the feed rate is obtained.

Most of the "gun drilling" type machines available have been designed primarily to cover the range used for high speed steel drills. This means that the top speeds of which the machines are capable will handle only the lower portion of the carbide speed range. Since it is not considered good practice to run any machine tool at its highest speed for a long period of time, many "gun drilling" jobs which have been tooled with carbides have been operating at too low a cutting speed and the full advantage of carbides was not obtained.

Feeds

Practically all "gun drill" work to date has been done with feeds within the range of .0006 in. to .0036 in. per revolution, the lighter feeds for the smaller size drills and the heavier feeds for the larger sizes, since the latter have the greater rigidity.

The rate of feed, however, also depends on the oil pressures being used and the size of the oil hole through the drill. In other words—for all-depth drills to function properly at high feed rates, the rate of oil flow must be sufficient so that there is no tendency for the chips to pack in the drill flute. It has been found that as the rate of feed is increased, there is an increased tendency for the drill to deviate from its true course.

Rotary All-Depth Drills

Frequently the question is asked if carbide tipped all-depth drills can be rotated instead of rotating the work. The general indications are that long drills should not be rotated because the unsymmetrical shape and the relatively small cross-section tend to set up an unbalanced condition which may result in drill chatter and a rapid breakdown of the cutting edge. It may be feasible to rotate a short drill, however. In this case, an alternative design of drill shown in Fig. 4 may also be used. The cutting angles may be comparable to those used in the stationary drills, while the chips would be carried out through the center of the drill instead of an external flute. The cutting oil in this case flows to the cut through a longitudinal flattened opening along the periphery of the drill, and returns through the center, carrying the chips.

Versatile New Grinder Saves Time —Improves Grinding Efficiency

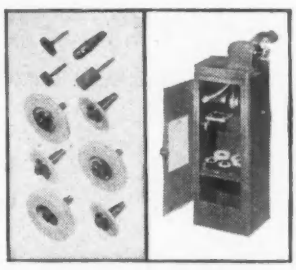
A new grinder, the Corlett-Turner G-3, permits changing of grinding wheels in a matter of seconds and assures a true running wheel at all times. Each wheel is individually mounted on a ground, tapered arbor.

Easy wheel changing is accomplished by a slight wrist motion on the end bells of the grinder head. A twist to the left releases the wheel arbor; the reverse action instantly secures it in place. It's all done in a matter of seconds. No costly time is lost in repeated wheel dressing.

In addition to its primary function, the G-3 grinder has innumerable uses for burring, buffing, polishing, and production applications requiring a high speed spindle. Powered by a 1/3 horsepower motor, a three-step pulley arrangement provides speeds of 5600, 8000, and 12,000 r.p.m.

Efficiency in precision work is also increased when tension is relieved by the act of chewing. And chewing Wrigley's Spearmint is a pleasant, easy way to help relieve workers' nervous tension. For these reasons Wrigley's Spearmint Chewing Gum is being made available more and more by plant owners everywhere.

Complete details may be obtained from
Corlett-Turner Co., 1001 S. Kostner Avenue
Chicago 24, Illinois



Grinding Wheels — Corlett-Turner Grinder

AC-65

what type seal is best for your design?

How Victor Seal-ology gives the right answer

Under given working conditions, one type of oil seal may or may not be the best. But why should you guess when Seal-ology can say positively *yes or no.*

Seal-ology as developed by Victor, is the modern science of pre-determining oil seal performance. It does so by first giving recognition in logical order to all factors of application. Then, by carefully providing in proper balance for each condition.

Fluid to be sealed, pressure, shaft speed and operating temperature are important, of course. Yet, Seal-ology begins in Victor Research Laboratories with endless checks and tests of raw materials and seal designs under actual working conditions.

Leader in sealing products research and manufacturing, Victor offers unmatched experience and facilities for producing all types of oil seals, gaskets, packings. When you don't find what you need in the broad Victor line, the Victor engineer in your territory will see that you get it.

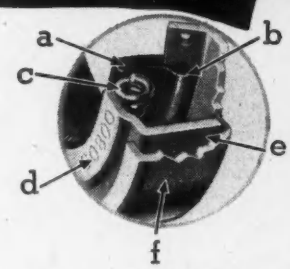
Victor Mfg. & Gasket Co., P.O. Box 1333,
Chicago 90, Illinois

Meets requirements of most standard applications. Available in wide range of sizes

Standard Victoprene Type "H"

MAXIMUM RECOMMENDED OPERATING LIMITS

Shaft Surface Speed	2,000 f.p.m.
Operating Pressure	10 p.s.i.
Shaft Surface Finish	5 to 25 Micro Inches
Shaft Surface Hardness	Min. 30 Rockwell C Scale
Shaft Eccentricity	.008-in. T.I.R.
Shaft Diameter Tolerance	.002-in. Plus or Minus
Temperatures: Continuous Operation	225 deg. F.
Intermittent Operation	250 deg. F.
Shaft Movement	Rotation—Oscillation



a Victoprene elastomer sealing element is highly resistant to lubricants, heat and aging.

b Sealing element is molded to shape and bonded to metal outer shell. Eliminates leakage through shell.

c Garter type tension spring applies uniform pressure on sealing element for perfect contact with shaft surface.

d Permanent identification with catalog number makes replacement easier.

e Double outer wall construction gives rigidity to case. Prevents distortion.

f Centerless grinding of outer periphery assures truly circular case and accurate press fit with bore.

Other Types in the Victoprene Line

Manufacturers of **SEALING PRODUCTS** *Exclusively*

VICTOR

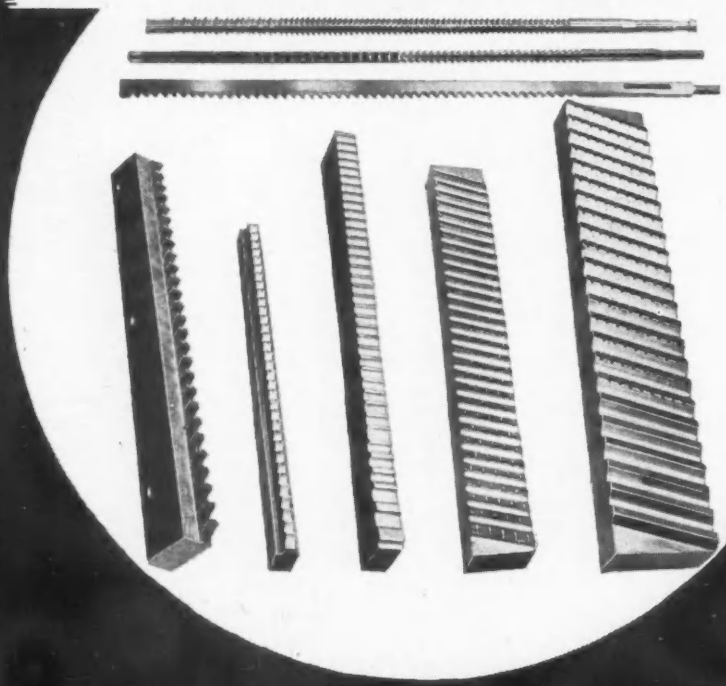
GASKETS • • OIL SEALS

VICTOR
GASKETS AND OIL SEALS
SEALING PRODUCTS THROUGH RESEARCH

The Greatest Name in the Gasket Industry

American BROACHES

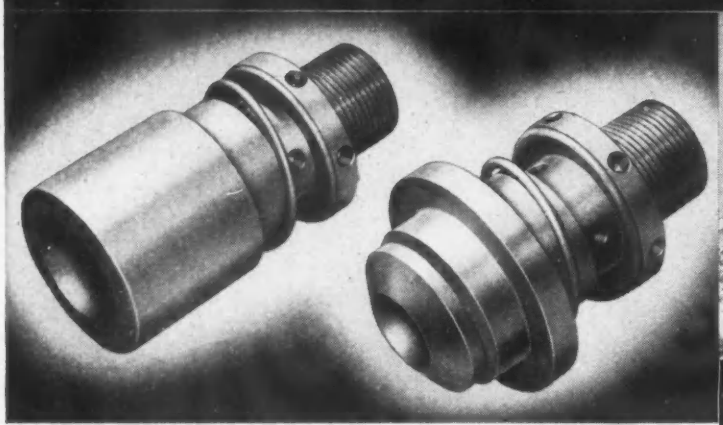
LAST LONGER ★ IMPROVE FINISH ★ REDUCE RESHARPENING



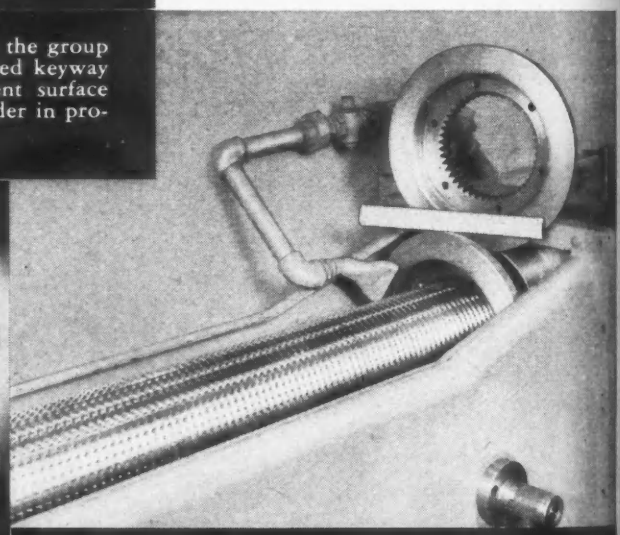
Shown above are a variety of *American* broaches. Included in the group are a round spline broach, a combination internal and inverted keyway broach, and a keyway broach. Also five sections of different surface broaches. In use, these sections are mounted in a broach holder in progressive stages to form a complete unit.

For every broaching operation, you are sure of better performance and longer life when you specify *American* broaches. *American* broaches give you efficient, dependable production on every type of broaching operation—on keyways, on internal operations such as splines and finishing holes, and surface operations on flats, cams, or irregularly shaped parts.

For the greatest broach economy, efficiency and dependability, insist on *American* broaches, made by a company with more than a quarter of a century's experience in the design and manufacture of broaches, broaching machines, and fixtures.



American offers a complete line of push and pull heads to help you get maximum value from your broaches. All types are available, correctly designed for round, flat, keyway, spline, and odd-shaped broaches. A free catalog gives complete data on *American* push and pull heads. Write for your copy today. Ask for Circular 700M.



More than 35,000 gears have been broached to date on this *American* broach, and the broach still has a life expectancy of 35,000 more. The secret of obtaining high production from a well-made broach is proper sharpening at regular intervals. For best results, follow the manufacturer's instructions implicitly: improper sharpening can ruin a good broach. Send for *American's* free catalog on broaches. Just ask for Circular 144G.

AMERICAN

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND MACHINE TOOL CO. S ROCKFORD ILLINOIS

See *American* First—for the Best in Broaching Tools, Broaching Machines, Special Machinery

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LINDE
USTRIES

Business in Brief

Written by the Guarantee Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES.

Continued advances in general business activity are indicated. The *New York Times* index for the week ended May 1 stands at 150.3, as against 146.3 for the preceding week and 146.5 a year ago.

Sales of department stores during the week ended May 8, as reported by the Federal Reserve Board, equalled 330 per cent of the 1935-39 average, as compared with 300 in the week before. Sales were six per cent above the corresponding distribution a year earlier, as against a preceding similar excess of seven per cent. The total in 1948 so far reported is six per cent greater than the comparable sum in 1947.

Electric power production increased slightly in the week ended May 8. The output was 9.3 per cent above the corresponding amount in 1947, as compared with a similar advance of 8.7 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 880,617 cars, 1.2 per cent less than the figure for the week before and 0.4 per cent below the corresponding number recorded in 1947.

Crude oil production in the week ended May 8 averaged 5,412,750 bbl daily, or 700 bbl less than the preceding average and 408,150 bbl above the comparable output in 1947.

Production of bituminous coal and lignite during the week ended May 1 is estimated at 13.8 million net tons, 19 per cent more than the output in the week before. The total production in 1948 so far reported is 17.4 per cent below the corresponding quantity in 1947.

Civil engineering construction volume reported for the week ended May 13, according to *Engineering News-Record*, is $149,236,000, or 32 per cent more than the preceding weekly figure and 14 per cent above the comparable sum in 1947. The total recorded for 20 weeks of this year is 25 per cent more than the corresponding amount in 1947. Private construction is two per cent below that a year ago, but public construction has increased by 66 per cent.

The wholesale price index of the Bureau of Labor Statistics for the week ended May 8 is 161.9 per cent of the 1926 average, as compared with 162.6 for the preceding week and 146.7 a year ago.

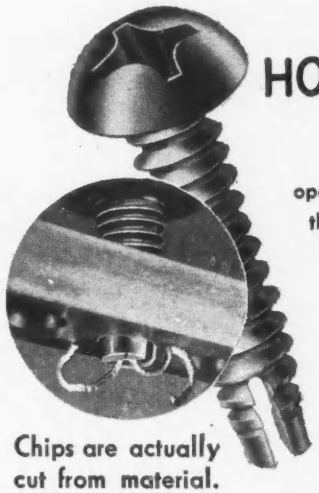
Member bank reserve balances increased $54 million during the week ended May 12. Underlying changes thus reflected include an advance of $182 million in Reserve bank credit and a rise of $205 million in Treasury deposits with Federal Reserve banks, accompanied by a decrease of $10 million in Treasury cash.

Total loans and investments of reporting member banks increased $192 million during the week ended May 5. An advance of $46 million in commercial, industrial and agricultural loans was recorded. The sum of these business loans, $14,205 million shows a net increase of $2252 million in 12 months.

Triple Threat to Production Problems

HOLTITE "TAP" SCREWS

U.S. Pat. No. 2,292,195 Other Patents Pending



Chips are actually cut from material.

This newest cost-cutting innovation eliminates tapping operations by actually tapping its own perfect mating threads in any material. The slot, corresponding to the flutes of a tap, provides two balanced cutting edges that actually remove material, and a chip reservoir that allows chips and cuttings to free themselves readily. Combining the cutting action of a tap with the economy of a screw this dual purpose fastening has solved innumerable production problems. Now available in 420 Stainless Steel, heat treated. Send for illustrated folder.

HOLTITE "LOCK-TITE" SCREWS

U.S. Pat. No. 2,226,491

As the lock washer is an integral part of the head, this economy fastening automatically eliminates lost time, waste and difficulties of handling separate lock washers. "Lock-Tite" screws are made to meet specific needs of user. Design of teeth, type of metal, hardening and tempering can be regulated to obtain the most efficient locking or binding action required for the application.

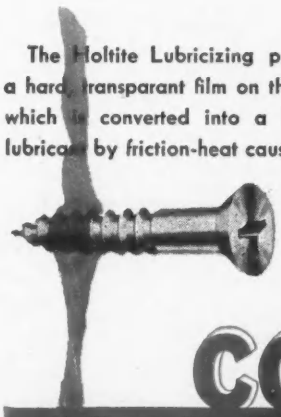
Unretouched photo shows progressive "locking bite" of washer teeth as screw is driven in. When setup, screw head is securely anchored in the material to effect a tighter, stronger, vibration-resisting fastening.

HOLTITE Lubricized

Reg. U.S. Pat. Off.

WOOD SCREWS · HANGER BOLTS
SHEET METAL SCREWS

The Holtite Lubricizing process produces a hard, transparent film on the screw surface which is converted into a highly efficient lubricant by friction-heat caused through driving. When cool, this lubricizing agent again solidifies setting the screw securely in the fibres of the wood. Eliminating time-wasting hand lubricants, this processing efficiently reduces binding and breaking when fastening in hard woods and in difficult applications.



CONTINENTAL SCREW CO.

New Bedford, Mass., U.S.A.

Personals

Recent Personnel Changes and Appointments at the Plants of the Automotive and Aviation Manufacturers and Their Suppliers.

Ford Motor Co.—**William R. Loughran** has been made Director of Supply for the International Div. **George M. Catchpole** has been appointed Asst. Manager of the Fleet Sales Section.

Chrysler Corp.—**Joseph M. Dodge,** President of the American Bankers Assoc. and President of The Detroit Bank, has been elected a Director of the Corporation. **H. O. Davideit** has been made Sales Manager for Trucks, Export Div.

Packard Motor Car Co.—**Karl M. Greiner,** General Sales Manager, has been appointed a Vice-President. **Hugh J. Ferry** was elected company Vice-President in addition to his duties as Secretary and Treasurer.

Plymouth Motor Corp. — **A. W. Ross,** formerly body engineer, has been made Asst. Chief Engineer.

Kaiser-Frazer Sales Corp. — **J. R. Lake** has been made Manager of the newly established Fleet Sales Div.

The White Motor Co.—**R. C. Carlin,** named Asst. Sales Manager, Service Sales Div.

Nash Motors Div., Nash-Kelvinator Corp.—**R. M. Neyhart,** made Asst. Sales Promotion Mgr. for Service.

Boeing Airplane Co.—**Artemus L. Gates** was elected a Director of the Company.

Westinghouse Electric Corp. — **D. W. R. Morgan,** of Philadelphia, and **John K. Hodnette,** of Sharon, elected Vice-Presidents, and **E. V. Huggins,** of New York, elected Secretary.

Worthington Pump and Machinery Corp.—**John O. Glenn,** formerly Asst. Manager, Merchandising Div., has been appointed Manager of the Pump and Compressor Merchandising Sales.

The Lincoln Electric Co.—New directors of the company are **W. R. Persons,** General Sales Manager and **K. F. Steingass,** Supt. Electrode Manufacture.

The Hydraulic Press Mfg. Co.—**Howard M. Hubbard** was elected President, filling the vacancy created by the resignation of **H. A. Toulmin, Jr.**

Allegheny Ludlum Steel Corp.—**W. F. Detwiler,** Chairman of the Board of Directors, has been named honorary Chairman. **Lester H. Bittner,** Director of Purchases, elected to the newly created position of Vice-President in Charge of Purchases.

Borg-Warner Corp. — **Robert W. Murphy** appointed General Counsel. He succeeds **G. A. Shallberg,** who continues as Executive Vice-President of the Corporation.

Jessop Steel Co.—**Edward M. Griffith,** appointed Executive Vice-President. **Curtis A. Gordon** has been named General Works Manager.

Leeds & Northrup Co.—**Paul V. Roth,** Shop Engineer since 1919, has announced his retirement. **Felix Wunsch,** a veteran of the engineering staff has also announced his retirement.

Modern Collet & Machine Co.—**Allen W. Lovell,** General Manager, has been elected Vice-President.

Reynolds Metals Co. — Industrial Machinery Div.—**H. V. Menking,** Division Manager; **G. L. Root, D. R. White** and **R. B. Clapper,** Development Engineers, with headquarters in Cleveland, Ohio.

Koppers Co., Inc., Koppers' Piston Ring Div.—**Lenvik Ylvisaker** appointed Asst. General Manager.

Plomb Tool Co.—**C. W. Coslow,** Vice-Pres. in Charge of Manufacturing, Los Angeles Plant and **M. M. Mautner,** Vice-Pres. and Secretary, were elected Directors.

General Electric Co.—**Charles W. Bentley** appointed Asst. to the Manager of the Company's new Decatur, Ill. plastics molding plant.

Tinnerman Products Inc.—**William M. Buttriss** appointed Director of Advertising and Sales Promotion.

United States Rubber Co.—**Howard H. Weber,** appointed Chief Engineer of Wire and Cable Dept. and **A. S. Basil,** General Sales Manager.

American Brake Shoe Co.—**M. B. Terry** appointed General Sales Manager of the American Brakeblok Div.

A new angle in farm wagons —with TUTHILL SPRINGS

THAT ANGLE IS IMPORTANT.

Ordinary farm wagons creak and groan at every hump of the road. Their bodies—mounted at four fixed points—must give and strain under every irregularity. The advantages of a rigid body are impossible.

But the Stahmer Farm Equipment Co., of Chicago, defies tradition by using a center-pivoted front bolster mounted over a Tuthill alloy steel spring leaf. The leaf keeps the wagon box level, yet permits the wheels to follow the natural contours of the ground—with full support at all times.

The Tuthill leaf thrives under hard use too. (Pyrometer-controlled heat treatment, plus a superior quality steel combine to give all Tuthill springs an extra toughness.)

This is another example how Tuthill has cooperated with a manufacturer to create an improved product. You, too, can benefit by the experience of Tuthill's spring engineers. Just drop us a letter, at no obligation.

WE RECOMMEND TUTHILL FOR QUALITY SPRINGS

TUTHILL Spring Company

760 W. Polk St., Chicago 7, Ill.

Quality Leaf Springs for Sixty-Seven Years

new Bullard type "K" economies widen scope of MULT-AU-MATIC method

Higher Speeds Meet New Job Requirements. Designed to lower production costs of small and medium sized jobs in cast iron, steel and light metal alloys, the new BULLARD Type "K" Mult-Au-Matic provides a wide range of spindle speeds up to 900 rpm to get full productive capacity out of modern cutting tools.

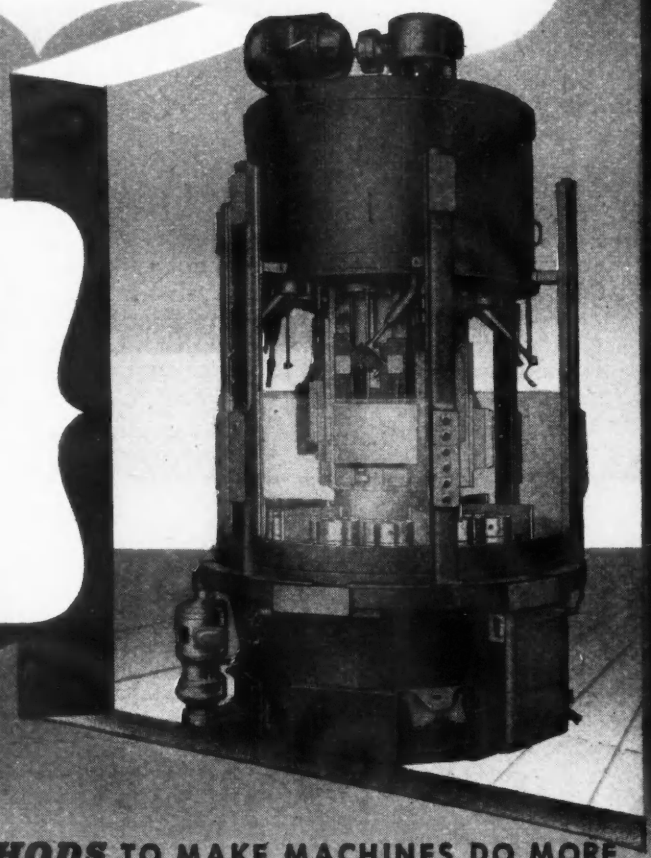
Saves Time Between Cuts. A newly developed index control mechanism permits faster return and advance of tool carrying heads and faster carrier index.

Higher Degree of Accuracy. New method of carrier index registry maintains repetitive accuracy from station to station, producing work to extremely close tolerances.

Improved Hydraulic Chucking Increases Efficiency. Work is chucked quickly by foot treadle control and automatically released as spindles return to loading station. Chucking pressure is adjustable to suit work characteristics.

Twin Spindles Double Production. Two of the four Type "K" models have twin spindles that deliver two finished pieces for every index cycle . . . a promise of lower production cost that is worth investigating further.

Write for complete information about the new Type "K" version of the Mult-Au-Matic method, one of the leading contributors to our modern American production system. THE BULLARD COMPANY, Bridgeport 2, Connecticut.



BULLARD Type "K" Mult-Au-Matics for work up to 10" in diameter come in four models: 6 or 12 spindles with speeds from 100 to 900 rpm, and 8 or 16 spindles with speeds from 98 to 880 rpm. 41 speed changes, 82 rates of feed, selective feeds and common speeds at all stations.

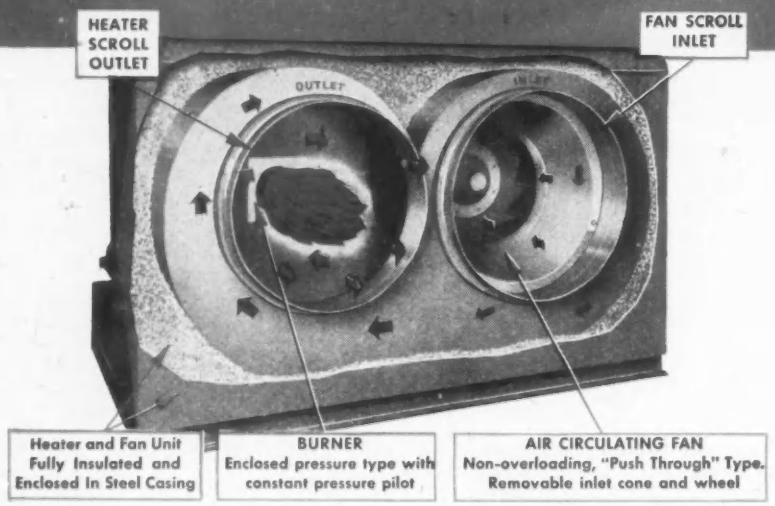
BULLARD

BULLARD CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

NEWCOMB-DETROIT

Scroll-Aire

Direct-Fired OVEN HEATER


HEATER SCROLL OUTLET
FAN SCROLL INLET
OUTLET
INLET
Heater and Fan Unit Fully Insulated and Enclosed In Steel Casing
BURNER Enclosed pressure type with constant pressure pilot
AIR CIRCULATING FAN Non-overloading, "Push Through" Type. Removable inlet cone and wheel

WITH DUAL BURNER ARRANGEMENT TO BURN

Gas AND/OR *Oil Fuel*

The Scroll-Aire Oven Heater will burn gas and oil fuel or either one individually as conditions require. The Scroll-Aire is a direct-fired heater which provides greater combustion efficiency. Combining the re-circulating fan, burner, insulated heater casing, combustion air blower, motors, drive and safety controls all on one platform, compact design makes the Scroll-Aire ideal for new oven installations or to "rejuvenate" old ovens. Send for descriptive bulletin which gives complete details on operation and use of this improved heater.

ENGINEERED FINISHING SYSTEMS

During the past thirty-five years, Newcomb-Detroit has designed, built and installed finishing systems for a wide variety of uses in all types of industries. Recently they completed the largest small parts finishing system in the world for an automotive manufacturer. Use this valuable experience to solve your finishing problem, whether large or small.

Established 1912

NEWCOMB-DETROIT COMPANY

Grand Rapids Division—Plant
GRAND RAPIDS, MICH.

Main Office and Plant
5741 Russell Street
DETROIT 11, MICHIGAN

Western Sales Office
CHICAGO, Ill.

General News

(*Continued from page* 23)

Continental Shipments 51% Above Last Year

Continental Motors reports that shipments of automotive and industrial engines was 51 per cent greater during the six months ending April 30 than in the same period last year. The total for the period was 122,355 units. Automotive and industrial engines accounted for approximately 60 per cent of the company's sales last year.

Average Car Life Today Twice That of 1925

AMA has some interesting facts in its current issue of *Automobile Facts* about the average life of modern automobiles compared with those produced 20 years ago. In 1925, the average age of cars was 6.5 years and average mileage at scrapping time was 25,750 miles. Since that time there has been a steady rise in both car life and mileage, with the average car being scrapped in 1946 at an average age of 12.7 years with 90,000 miles. The average would be even higher, AMA points out, if it were possible to leave out of consideration cars scrapped before their useful life was ended by wrecks. Average yearly mileage back in 1925 was about 4000 miles, but in 1941 the yearly travel average was nearly 8000 miles. Average yearly mileage today, according to AMA estimates, is about 9500.

Car Installment Credit Continues Up

Automobile installment buying continues the upward trend which has been consistent for many months. Outstanding automobile credit sales jumped upward more sharply in March than in any month since the middle of last year, according to the Federal Reserve System Board. At the end of March, outstanding automobile credit stood at $1363 million, an increase of $109 million over February, and $672 million above the March 31, 1947 figure.

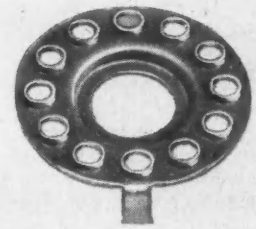
New Duesenbergs to Sell For Over $30,000

Planning to revive the manufacture of Duesenberg automobiles in a plant at Indianapolis, Marshall Merkes, president and treasurer, has stated that the custom-built cars will be designed with eight-cyl engines and will sell for more than $30,000. Vice president in charge of engineering is August S. Duesenberg who was associated with the company when it was operating several years ago. William Beckman, who helped design the original Duesenberg, is also associated with the new company.

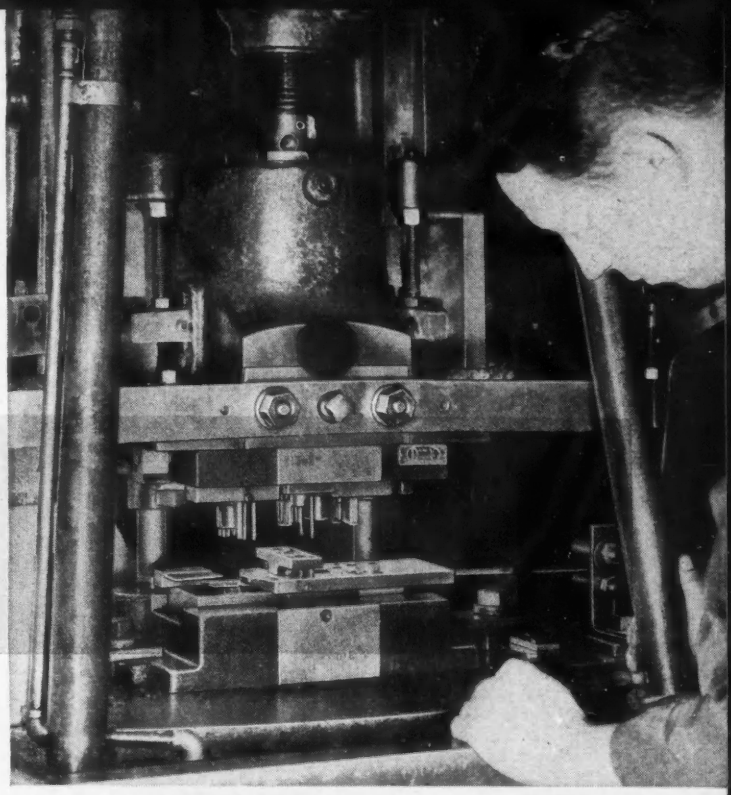
(*Turn to page* 90 *please*)

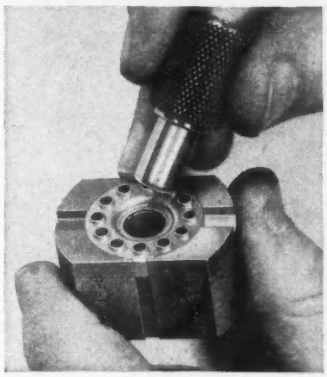
•7200 stainless steel stampings per hour—

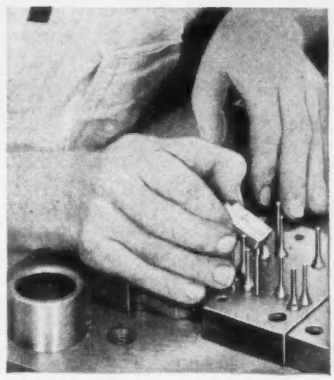
•tolerances held within 0.002"——



...using DANLY STANDARD PRECISION DIE SET







Sustained operating precision of die set reduces die wear...produces 200,000 stampings per grind

Inherent accuracy in Danly Die Sets permits taking full advantage of the die maker's precision under actual press operating conditions. As a result, close tolerances may be held and tool life is substantially increased.

In the stamping operation shown, stainless steel parts for electrical instruments are pierced, formed and blanked in an intricate progressive die. Tolerances are extremely close, and finished parts must pass rigid gage inspection.

Stampings are produced at a rate of 120 per minute. At this high speed, a tolerance of 0.002 in. is held on inside and outside diameters and the distance between the bent arms. Danly Die Set accuracy is a major factor in maintaining punch-and-die relation, resulting in production of 200,000 parts between grinds.

DANLY ENGINEERING SERVICE—Use Danly Die Sets to insure the same close precision, high production and long die life on all of your press work. Consult our Engineering Dept. for helpful recommendations on die sets—large or small, standard or special—for *any type* of press operation. (No obligation.)

DANLY NATION-WIDE ★ASSEMBLY SERVICE

Danly offices in 10 key cities give immediate attention to your orders. Assembly plants (marked with stars) stock interchangeable parts for quick delivery of any standard die set to your specifications.

★ **Chicago 50,** 2100 S. 52nd Ave.
★ **Cleveland 14,** 1550 E. 33rd St.
★ **Dayton 2,** 990 E. Monument Ave.
★ **Detroit 16,** 1549 Temple Ave.
★ **Grand Rapids,** 113 Michigan Ave., N. W
★ **Long Island City 1,** 47-28 37th St.
★ **Los Angeles 54,** Ducommun Metals & Supply Co., 4890 S. Alameda
● **Milwaukee 2,** 111 E. Wisconsin Ave.
● **Philadelphia 44,** 18 W. Chelten Ave.
★ **Rochester 4,** 16 Commercial St.

get this *free* bulletin

Write for this informative bulletin, indicating the nature of your requirements.

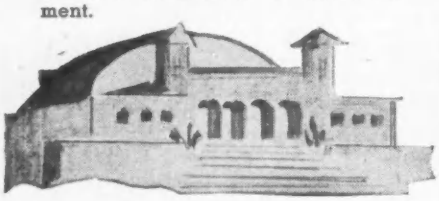
DANLY MACHINE SPECIALTIES, INC.
2100 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

PRECISION DIE SETS...STANDARD AND SPECIAL | MECHANICAL PRESSES AND PRESS EQUIPMENT

ATLANTIC CITY
by-the-sea
June 28 to July 1

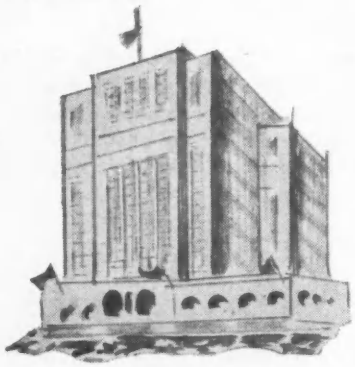
INDUSTRIAL FINISHING EXPOSITION

A comprehensive exhibit of equipment and supplies for manual and automatic electroplating, polishing and buffing, cleaning and degreasing, tumbling and burnishing, enameling and lacquering, and allied processes. Of interest and value to all manufacturers concerned with metal surface treatment.



A. E. S. CONVENTION

35th Annual Convention of the American Electroplaters' Society combines profitable learning and observation with pleasant relaxation. Technical Sessions bring outstanding technicians and production men to tell how to do better plating and finishing. Complete program of entertainment provided by the Convention and the famous seashore resort.



Make plans now to attend this Exposition and Convention. Exposition and Technical Session in Atlantic City's Convention Hall; Convention Headquarters in Ambassador Hotel. Sponsored by the A.E.S. Newark Branch.

For further information, write

American Electroplaters' Society
Convention and
Exposition Committee
35 Fourth Street, Newark 7, N. J.

General News

(*Continued from page* 88)

Ruthrauff & Ryan Name Reed Mgr. of Detroit Office

Tod Reed, vice president, Ruthrauff & Ryan, Inc. has been appointed manager of the Detroit office.

Name Kindelberger Chairman of North American

The directors of North American Aviation, Inc. recently advanced J. H. Kindleberger and J. L. Atwood to chairman of the board and president, respectively. Mr. Kindelberger, formerly president, succeeded Henry M. Hogan, who has resigned. Mr. Hogan is vice president and general counsel of GM.

Tool Groups Sponsor Sales Course at Cornell

Part of the vigorous promotion program planned for 1948 by the National Machine Tool Builders' Association, a special summer short course in sales engineering will be held July 12-23 at Cornell University, Ithaca, N. Y. During the two week course, which will be conducted in cooperation with the NMTBA and the American Machine Tool Distributors Association, leaders from industry and educators will discuss 47 different sales engineering topics.

Detailed accuracy marks the scale model Buick shown above which was recently completed by Pierre Langevin, of Hull, Quebec, Canada.

(*Turn to page* 92, *please*)

Classified Advertisement

WANTED A well established Midwestern Corporation has an opening for an electrical engineer familiar with thermal type circuit breakers and related devices. The applicant must be capable of taking complete charge of a development program. Salary commensurate with ability and experience. Box 52, Automotive Industries, 5601 Chestnut St., Philadelphia 39, Pa.

Manufacturers representative covering Metropolitan New Jersey, desires nationally known line. Valuable contacts and satisfactory representation assured. Box 53, Automotive Industries, 5601 Chestnut Street, Philadelphia 39, Pa.

ASK ANY OF THE
Big Paper Mills

Speaking of ground water . . . When the record shows an almost 100 percent exclusive use of Layne Well Water Systems for the entire United States and Canadian paper mill industry, it is time for the Layne Organization to take a bow. But such is the case and that enviable fact is due to Layne's consistently maintained top flight quality, high efficiency and the important KNOW HOW of modern well water system construction.

Day after day and year after year, Layne Well Water Systems continue to produce the 40 tons of water required in the making of each ton of paper. It is these same kind of well water systems that Layne builds for railroads, petroleum plants, packing houses, breweries, air conditioning installations, chemical plants, irrigation projects, municipalities—or in any situation where huge quantities of water must be produced at extremely low cost.

No other well water systems are as widely used or highly praised as those bearing the name Layne. For literature, address Layne & Bowler, Inc., General Offices, Memphis 8, Tennessee.

LAYNE WELL WATER Systems

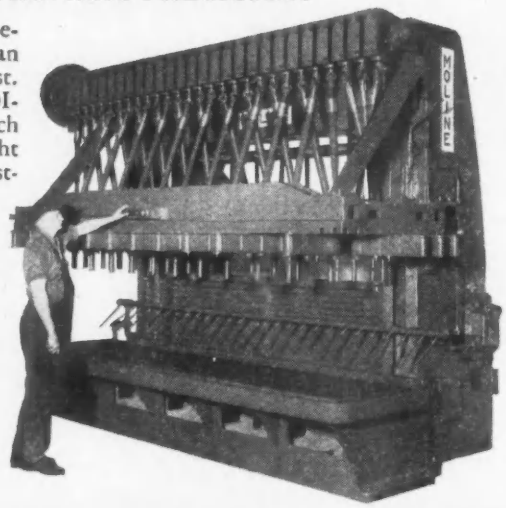
AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La., ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Pacific, Inc., Seattle, Wash. ★ Layne-Texas Co., Houston, Texas ★ Layne-Western Co., Kansas City, Mo. ★ Layne-Western Co. of Minn., Minneapolis, Minn. ★ International Water Supply Ltd., London, Ont., Can. ★ Layne-Hispano Americana, S. A., Mexico, D. F.

Regardless of Shape
Bunting manufactures Special Bearings to your blueprint. Cylindrical or flanged, tapered, slotted, milled, drilled, splined, broached, knurled, threaded, grooved—Bunting has the equipment to do it.
One great advantage of the sleeve bearing is that it can be adapted to your design. There are no arbitrary standards to impose the requirements of one industry upon another.
Bunting engineers have experience and valuable knowledge to help you in designing the bearing to meet your conditions.
The Bunting Brass & Bronze Company, Toledo 9, Ohio.
Branches in Principal Cities.
PRECISION BRONZE BARS
BRONZE BEARINGS
BUSHINGS
Bunting

★ At greater Man-Hour SAVINGS
★ At higher rated EFFICIENCY
★ At finer, effortless PRECISION

A Moline Multiple Spindle Specially Designed Machine Tool can do your job better at less cost. Ruggedly built to fit your INDIVIDUAL requirements in such operations as Boring — Straight Line Drilling — Universal Adjustable Spindle Drilling — Honing — Tapping — Reaming — Counterboring — Special Milling — these machines are based on years of experience accumulated since 1901.

For your SPECIAL problem, go "Hole-Hog" and write us for any information you may need.



No. HU68
DRILLER

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

MOLINE TOOL COMPANY
100 20th Street Moline, Illinois

General News

(*Continued from page* 90)

Hiram J. Leonard

Hiram J. Leonard, 67, a director of Willys-Overland Motors, Inc. and chairman of the board of Wilson Foundry & Machine Co., Pontiac, Mich. died on May 17, in Toledo, O.

Frederick Van Cleve Cole

Frederick Van Cleve Cole, 57, editor and vice president of the Jewelers' Circular-Keystone, and a director of the Chilton Co., died on May 9, 1948 in Forest Hills, Queens, New York.

Dr. Frank C. Clements

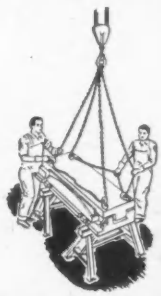
Dr. Frank C. Clements, 73, first director of GM Research Laboratories, died on May 7 in Westerville, Mich.

Frederick G. Wacker, Sr.

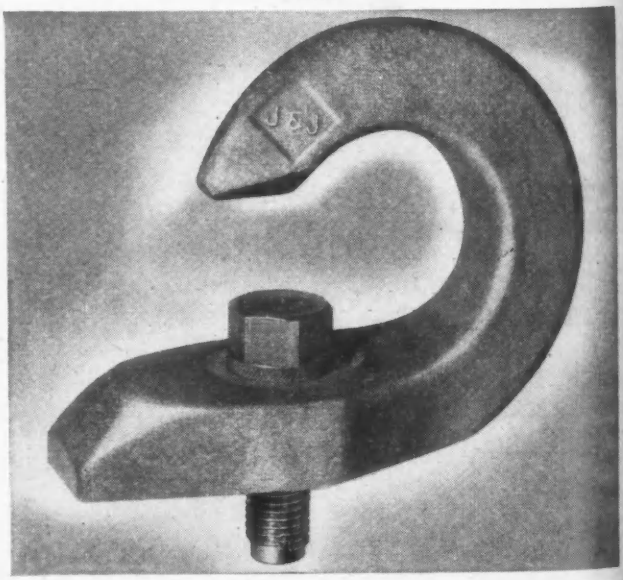
Frederick G. Wacker, Sr., 59, president of the Automotive Maintenance Machinery Co., North Chicago, and a former president of the Motor & Equipment Manufacturers Association, died on May 17 in Chicago.

J&J

LIFT HOOKS



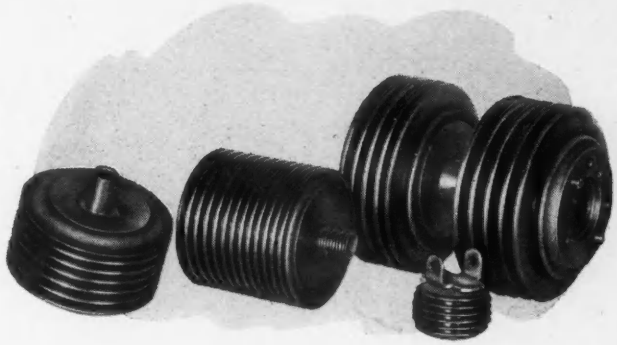
FOR THE SAFE, EASY HANDLING OF DIES AND HEAVY PARTS



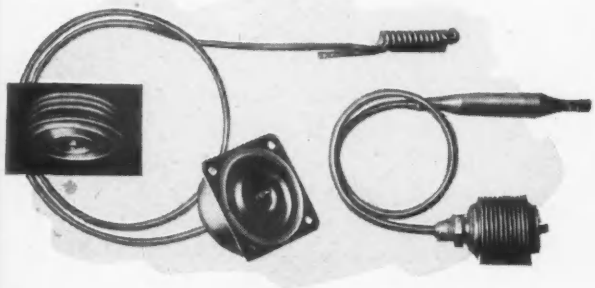
● J & J Lift Hooks have won enthusiastic endorsement from users everywhere. They speed handling—prevent accidents—and repay their initial cost in just a few days time. The forged chrome-nickel hook and chrome-vanadium bolts, magnaflux tested—and with self-cleaning, ground threads—cannot be disassembled, thus avoiding any danger of substituting low strength bolts. Four sizes with capacities up to 15 tons. Try a few—you'll never again be without them. Prices and fully descriptive data sheet sent promptly on request.

FORGE AND MACHINE DIVISION
OF
THE JOHNSTON & JENNINGS CO.
907 ADDISON ROAD
CLEVELAND 14, OHIO

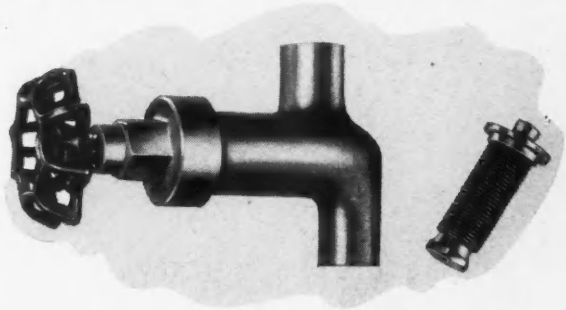
How do BELLOWS ASSEMBLIES *like these fit into your planning?*



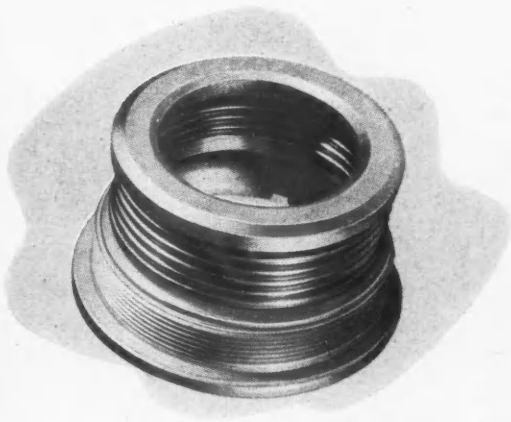
Some typical bellows assemblies for temperature and pressure control.



Bellows assemblies for refrigeration and air conditioning.



⅛" packless valve and its bellows assembly for vacuum systems.



Bellows seal assembly for protecting rotating shafts against leakage.

The easiest, most economical way to find out whether bellows assemblies can improve *your* products, too, is to turn your problem over to our engineering department *before your plans are too far advanced.* Each of the bellows assemblies illustrated above was designed by us to fit specific requirements. Your sketches and specifications will be similarly analyzed *in confidence* . . . and a recommendation sent to you promptly.
CLIFFORD MANUFACTURING COMPANY,
563 E. First Street, Boston 27, Mass.
Offices in Detroit, Chicago and Los Angeles. *First with the Facts on Hydraulically-Formed Bellows.*

CLIFFORD HYDRON Metal Bellows

HYDRAULICALLY-FORMED BELLOWS

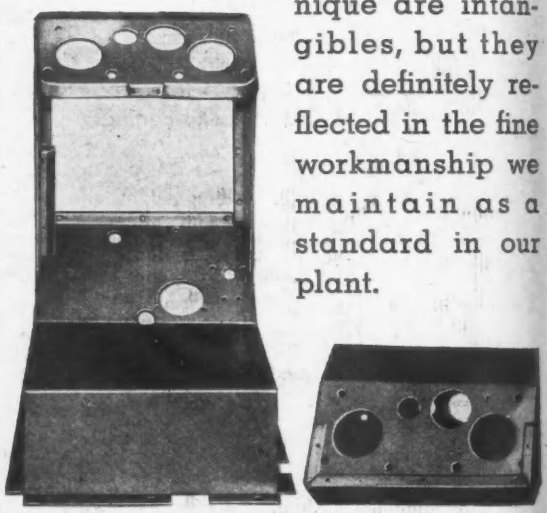
ALL-ALUMINUM OIL COOLERS

Feather Weight

Talent plus Technique

It takes unusual intelligence and years of practice to develop a technique that is worthy of outstanding talent. This applies equally well to the expert worker in metals as well as to the great musicians of our day.

Talent and technique are intangibles, but they are definitely reflected in the fine workmanship we maintain as a standard in our plant.



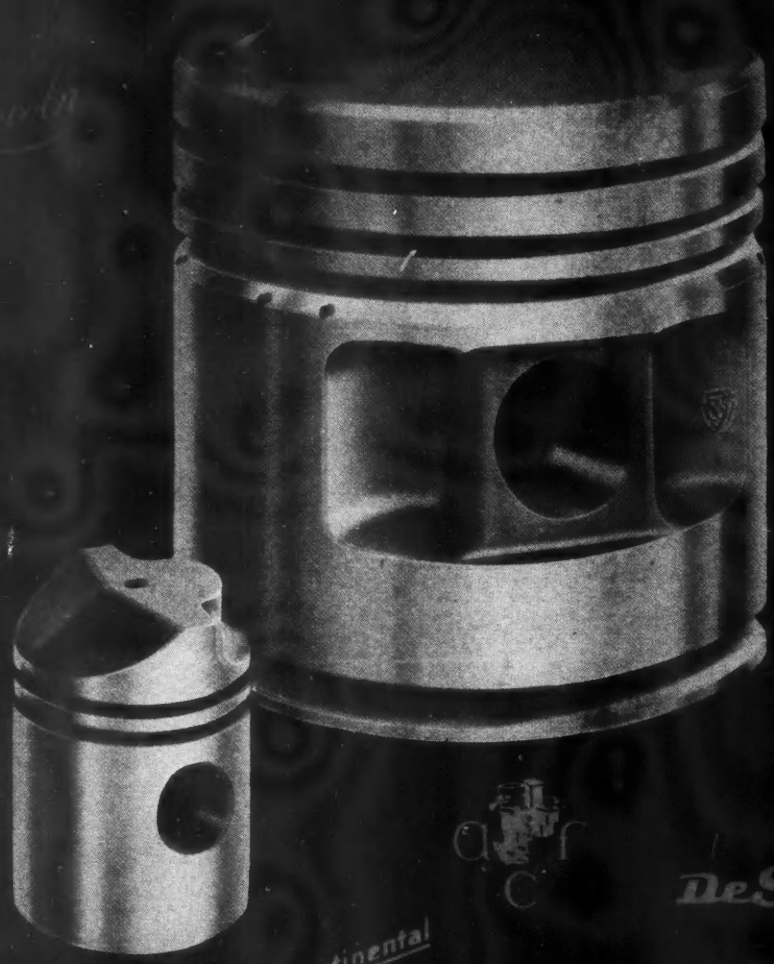
Write, phone or wire for detail information regarding capacity and facilities.

O. L. ANDERSON CO. Inc.

1347 EAST FORT STREET • DETROIT 7, MICHIGAN

Manufacturers of

FUEL TANKS and SHEET METAL STAMPINGS FOR THE AUTOMOTIVE INDUSTRY



STERLING

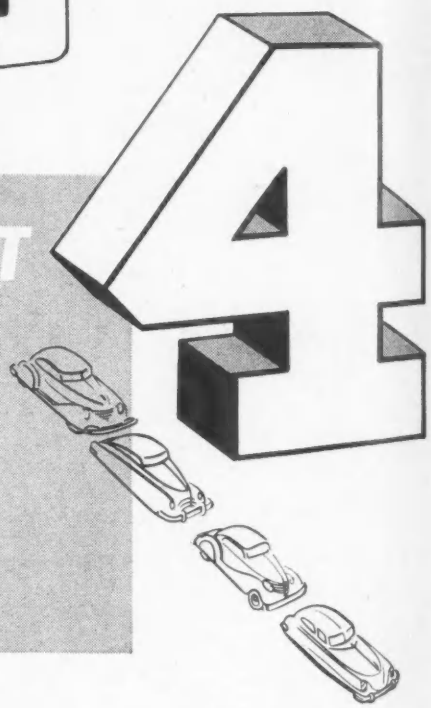
the Leading Name in ALUMINUM PISTONS

Serving the Majority of the Most Discerning Accounts in the Automotive Industry for Over 25 Years

STERLING ALUMINUM PRODUCTS, INC. ST. LOUIS, MO.

For 1949 Models -

— BUT AT LEAST



Automotive Manufacturers will be using

The HOUDAILLE* Viscous Damper

An exclusive development of the Houde Engineering Division, patents pending.

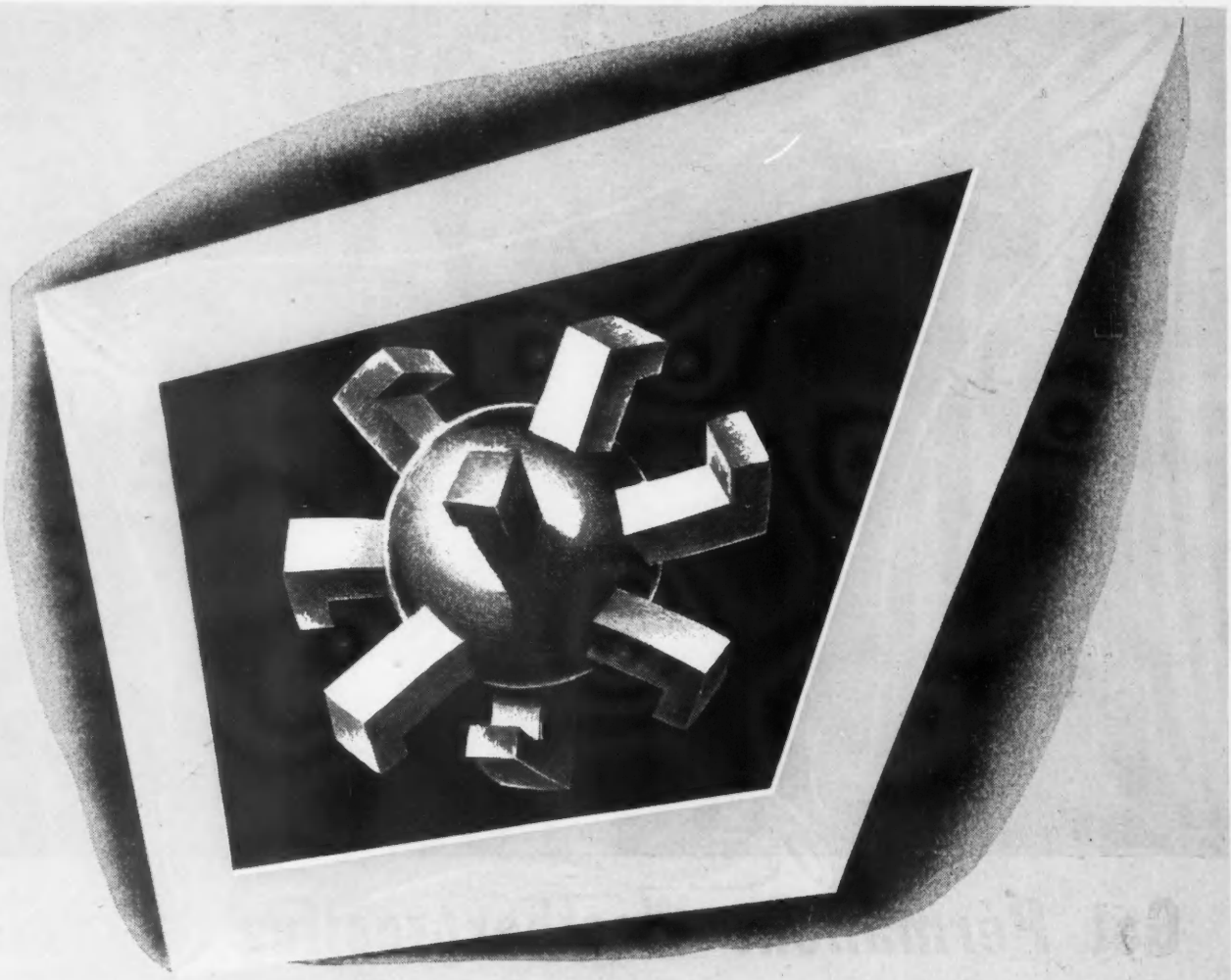
● That the Houdaille Viscous Torsional Vibration Damper has proven the claims made for it is attested to by the fact that at least four manufacturers in the automotive field have adopted it for 1949 models. In addition, many builders of diesel engines are already using it as standard equipment.

Thus, the Houdaille Damper has established its effectiveness in minimizing both major and minor critical orders of vibration. Since it embodies no wearing parts and requires no maintenance, lubrication or adjustment, its adoption adds nothing to the service department's responsibilities.

Houdaille engineers will be glad to discuss the application of the Viscous Torsional Vibration Damper to any internal combustion engine large or small.

HOUDAILLE-HERSHEY CORPORATION
HOUDE ENGINEERING DIVISION
Makers of Hydraulic Controls
BUFFALO 11, NEW YORK

*Pronounced Hoo-dye



A Thingamabob's the thing!

Perhaps you've never heard of a Thingamabob —and, confidentially, we haven't either—yet. But the day we're called on to cast Thingamabobs it's a million to one we'll find a way to do it.

Why the odds? Because C. W. C. specializes in casting steel and iron to unusual specifications—in volume. Behind every casting are years of experience and research in the development of the right casting for the right job.. C. W. C.'s precise control of the casting process assures you that your part will be cast exactly as specified.

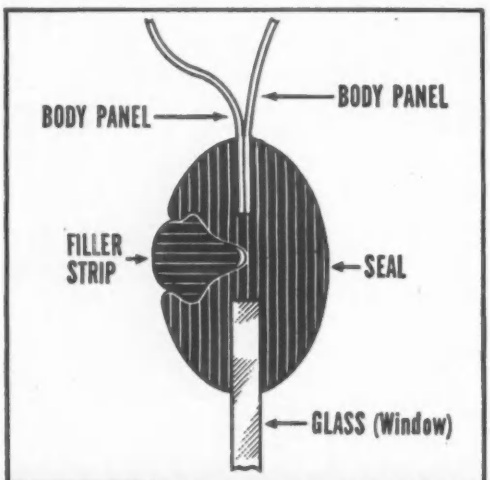
CAMPBELL, WYANT AND CANNON FOUNDRIES

MUSKEGON, MICHIGAN: *Henry Street Plant* • *Sanford Street Plant* • *Broadway Plant*
SOUTH HAVEN, MICHIGAN: *National Motor Castings Div.* • LANSING, MICHIGAN: *Centrifugal Fusing Co.*

CWC 1908-1948 **40 YEARS OF FOUNDRY PROGRESS**

CAMPBELL, WYANT AND CANNON FOUNDRY COMPANY
MUSKEGON, MICHIGAN

Get *Permanent* Weatherproofing at *Lower* Installation Cost!



Here's how it works. Seal set on body panel. Glass set in seal. Filler strip zipped in. No sub-assembly preparation, cement, cleanup or reworking. Simple, easy and economical. One job of weatherproofing—for keeps!

The secret lies in the ease and speed with which Inland Self-Sealing Weather Strip is applied to windows or windshields. It's a simple one-man job—so fast that installation time is amazingly short and cost amazingly low!

There's no preparation, sub-assembly, reworking or cleanup. No cement is used. Just three swift operations — the Inland seal set quickly on the body-panel opening — the glass worked easily into its channel in the seal — the exclusive Inland Filler Strip fed zipperwise into the locking channel. That's all! But the result is *permanent* weather-sealing, leak-proof under the most severe conditions. A one-time, one-man job, at lowest first cost, and with no reoperation cost! Write today for details.

INLAND MANUFACTURING DIVISION
GENERAL MOTORS CORPORATION • DAYTON, OHIO

Self-Sealing Weatherstrip (PATENTED)

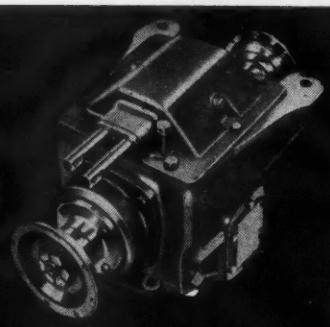
INLAND

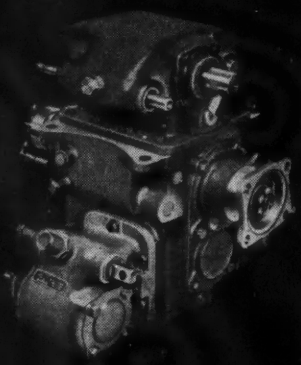
BY INLAND MANUFACTURING

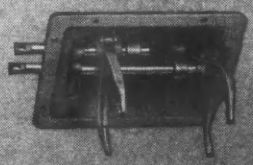
Spicer

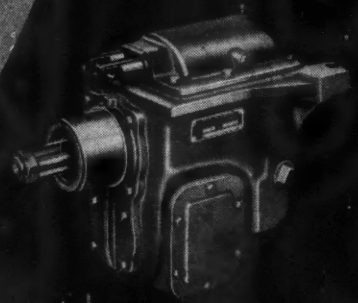
Auxiliary TRANSMISSIONS

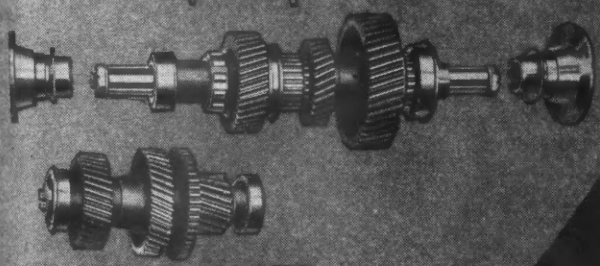
for ANY LOAD
ANY SPEED
ANY TERRAIN

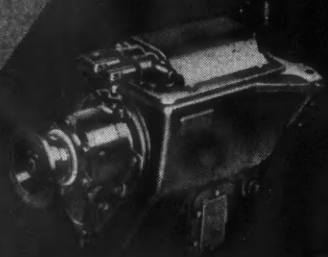


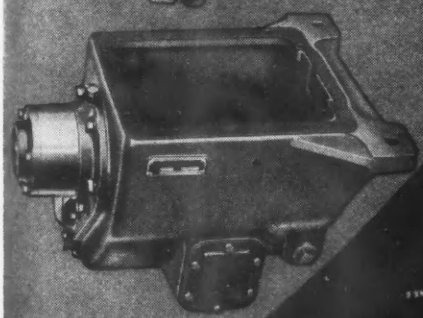


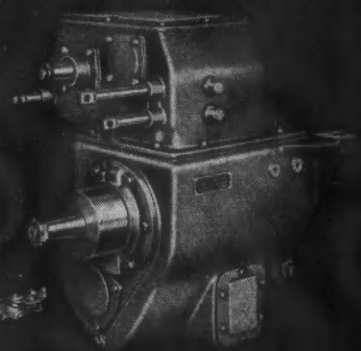


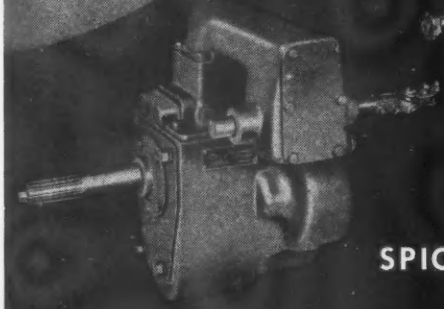












• Spicer Auxiliary Transmissions are offered in a wide range of models and ratios, permitting an accurate selection of the most efficient, most economical speeds for any condition of industrial, oil field and other truck operation.

Spicer 3-Speed Auxiliary Transmissions are designed with helical gears and clutching collars. They are available with or without top-mounted Power Take-Offs. Spicer engineers will work with you on the adaptation of dependable power transmission equipment to your particular needs.

SPICER MANUFACTURING
Division of Dana Corporation
TOLEDO 1, OHIO

44 YEARS OF
Spicer
SERVICE

TRANSMISSIONS • TORQUE CONVERTERS • PASSENGER CAR AXLES • CLUTCHES • PARISH FRAMES
SPICER "BROWN-LIPE" GEAR BOXES • RAILWAY GENERATOR DRIVES
STAMPINGS
UNIVERSAL JOINTS

TAKE THE NADELLA ROAD

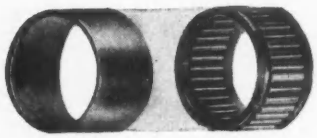
IT'S THE ROAD TO SUCCESS...

THE
FAMOUS
ORIGINATORS
OF
NEEDLE CARTRIDGES
AND
NEEDLE BEARINGS
WITH NEEDLE RETAINERS

FOR THE AUTOMOTIVE INDUSTRIE

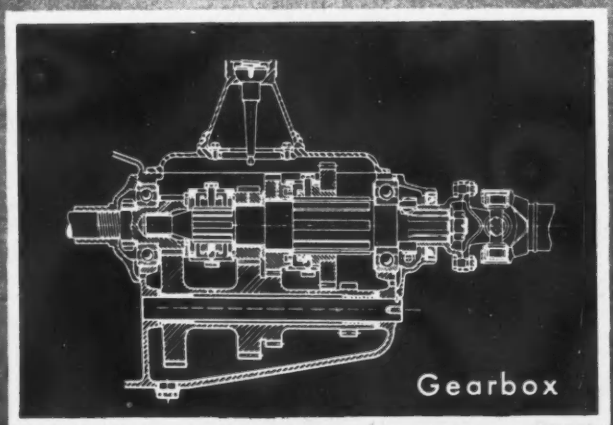
loose needles

needle cartridges



complete bearings

Special informations on request



Gearbox

Sté Ame des ROULEMENTS A AIGUILLES

15-17 Rue GUSTAVE EIFFEL — NADELLA — LEVALLOIS-PERRET (Seine) FRANCE

ACTAM.

4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

"Hearing is Believing"

THAT AMERICAN PHILLIPS SCREWS

Cut Costs···Kite Sales

...when you listen to makers of Electronic Products like these:

HOW THEY CUT COSTS: Says one hearing-aid manufacturer, "American Phillips Screws save us as much as 50% in time alone — and what they've saved us by banishing spoilage runs into even *more* money!" Simply because American Phillips Screws can't slip, can't slash, *can't drive any way but straight.* And because they're so much easier to handle, aim, and drive . . . without "dropsy."

HOW THEY KITE SALES: American Phillips Screws give all types of products a smart new look . . . a strikingly improved appearance over ugly, burred, slotted screws. And when you really *merchandise* their better holding power and greater vibration-resistance —which add up to fewer servicing needs — you've got an earful that drives home more sales. Find out what American Phillips Screws can do for *your* product. Write.

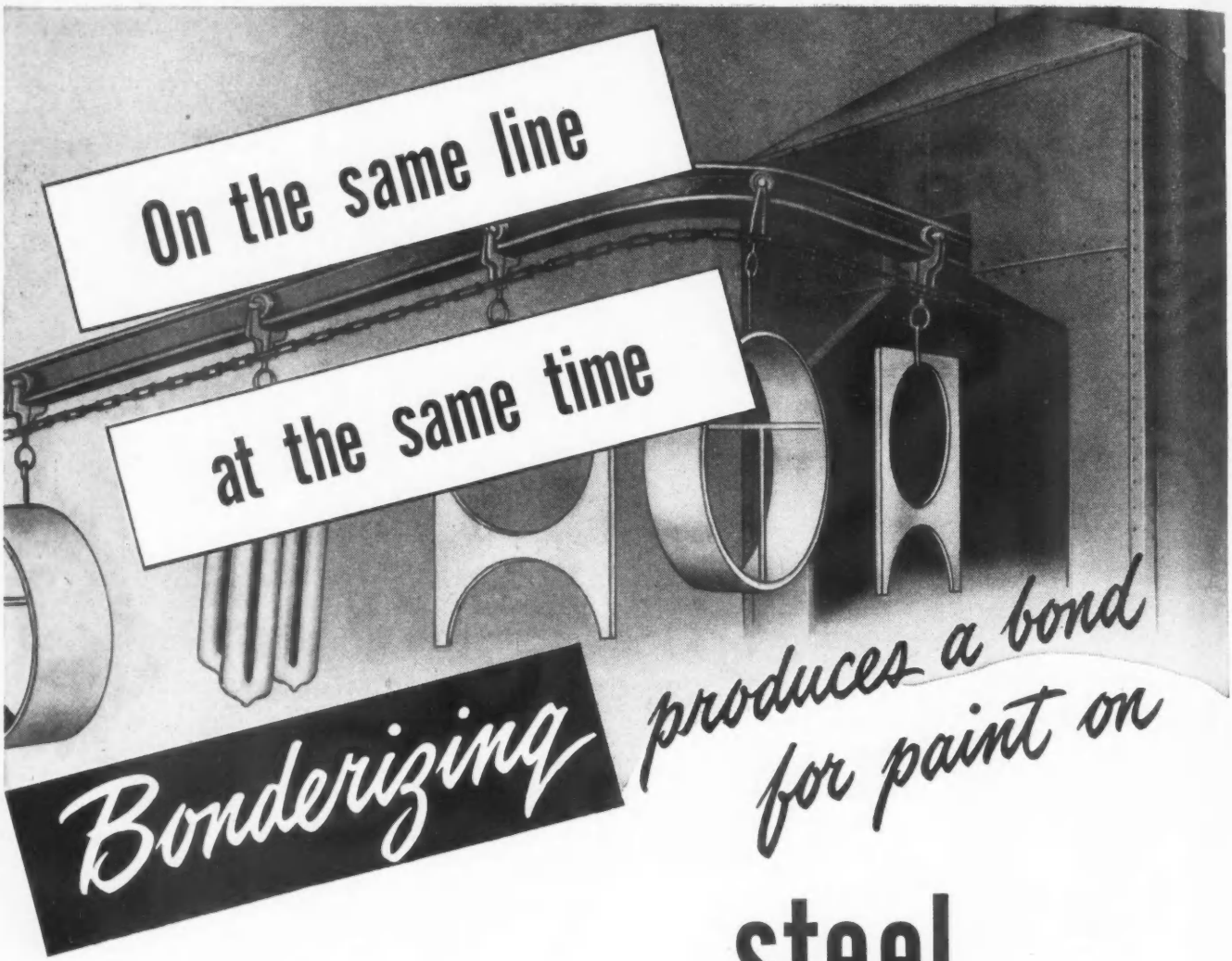
AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

Chicago 11: **589 E. Illinois St.** *Detroit 2:* **502 Stephenson Building**

AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)



Bonderizing produces a bond for paint on steel zinc aluminum

Developed especially for manufacturers with mixed metal production, the Bonderizing process produces a paint-holding, protective Bonderite coating on steel, zinc, and aluminum simultaneously.

No need now to separate these metals on the finish line. Steel, zinc, aluminum – and their alloys – can travel a single conveyor line from cleaner to paint booth. Quickly, simply, economically, and with equal effectiveness, the Spra-Bonderite process converts these metal surfaces to the characteristic nonmetallic phosphate coating of paint-holding, corrosion-resistant Bonderite.

Now, *all* the parts of your product – whether made of aluminum, steel, zinc, or alloys of these metals–can have the lasting benefits of Bonderizing under the paint finish!

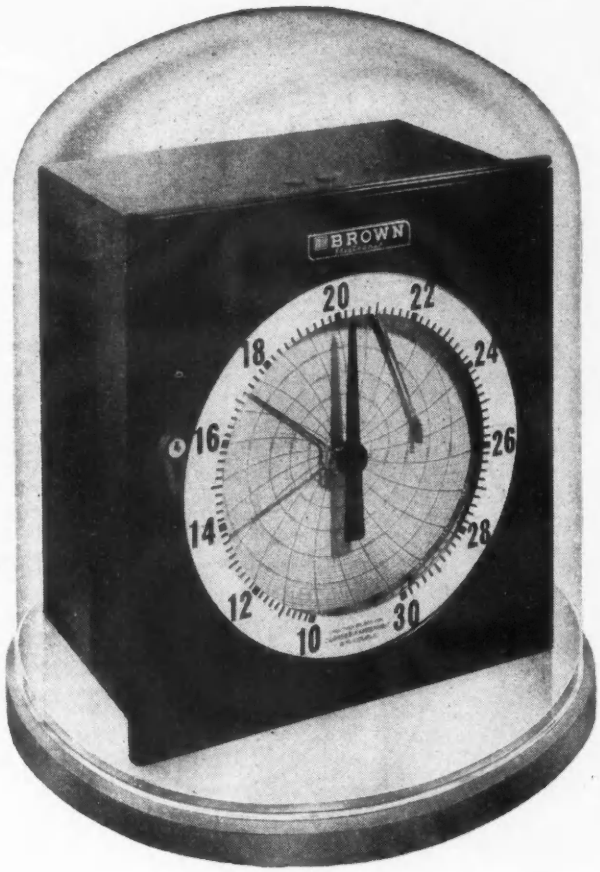
Learn how this process can add longer lasting fine finish and appearance to your product. Write today for full information on Bonderizing for Mixed Production.

Bonderite, Parco, Parco Lubrite – Reg. U. S. Pat. Off.

PARKER

PARKER RUST PROOF COMPANY
2178 East Milwaukee Ave.
Detroit 11, Michigan

BONDERIZING Holds Paint to Metal . . . PARKERIZING Inhibits Rust . . . PARCO LUBRIZING Retards Wear on Friction Surfaces

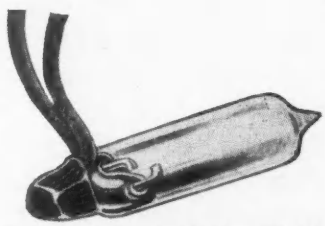


How to cut down instrument maintenance

You could cut down maintenance if you kept your instruments under bell jars. Dirt, dust and corrosive atmosphere would be sealed out. Dirty control contacts would be eliminated.

But don't requisition bell jars yet. Essentially, we've built better than bell jars right inside the Brown *ElectroniK* Potentiometer. Practically all the moving parts have been put into electronic vacuum tubes. The important control contacts are mercury switches forever sealed in glass—permanently protected against atmospheric conditions. The few moving parts are rugged and oversized, and all protected by a dust and moisture-resistant instrument case.

Seven years of performance in all industries has proven that the Brown *ElectroniK* Potentiometer requires only negligible maintenance. Add this important advantage to its greater accuracy, sensitivity and speed of response and you will see why the Brown *ElectroniK* Potentiometer is by far the leader in the field.



For a complete description, write for Catalog 15-9.

THE BROWN INSTRUMENT CO., 4548 WAYNE AVE., PHILADELPHIA 44, PA.
DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR CO.

Offices in principal cities of the United States, Canada and throughout the world.

BROWN *Advanced Instrumentation* FOR BETTER PROCESSING

Product of MINNEAPOLIS **Honeywell**

STEELS

for Automobile Springs

Bethlehem produces the entire range of alloy steels used for helical and elliptical springs in modern automobiles.

Among the various grades with adequate depth-hardening characteristics that are widely specified for this purpose are AISI 6150, 5150, 4063, and 9260.

Used in the manufacture of automobile springs, these steels provide such advantages as high impact value, excellent resistance to fatigue, and ready response to heat-treatment. Finished springs containing these grades give long and dependable highway service.

In addition, we supply other grades to meet the special or individual requirements of automobile, truck and bus manufacturers.

Our metallurgists will gladly advise you concerning application and treatment of alloy steels for automotive uses. They will make every effort to help improve your product and reduce your costs by the careful selection of grades.

★ BETHLEHEM STEEL ★

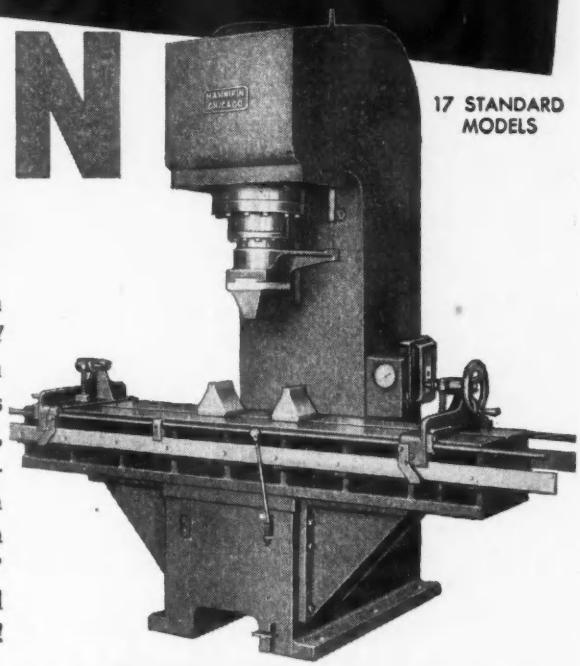
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM ALLOY STEELS

Standardized HANNIFIN HYDRAULIC PRESSES

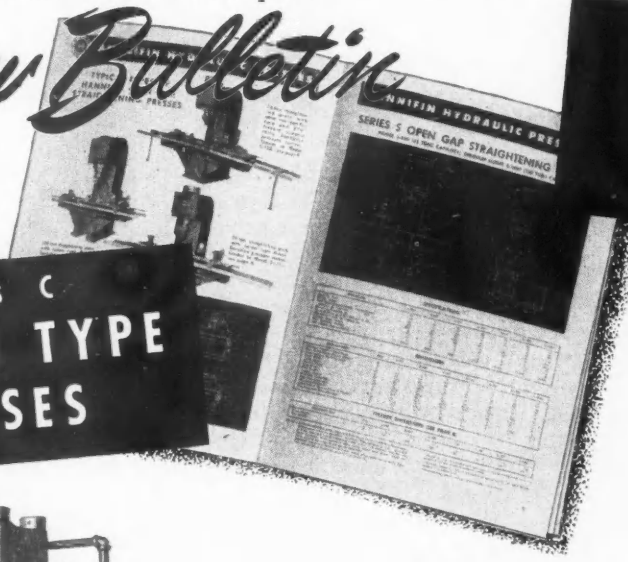
SERIES S
STRAIGHTENING PRESSES



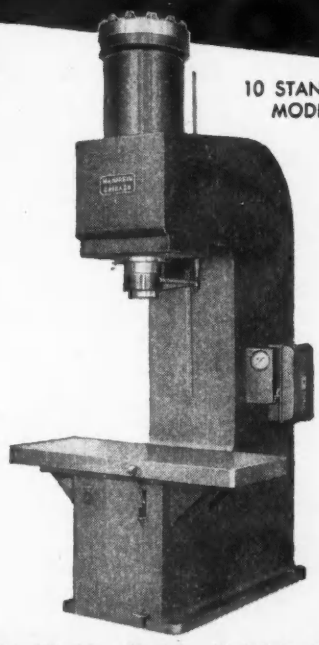
17 STANDARD MODELS

HERE'S help for production men who want presses in a hurry! Hannifin now offers a complete *standardized* line of open gap and column type hydraulic presses in a full range of capacities from 6 to 150 tons. Out of this line, it's easy to select the press you need for forcing, straightening, forming, assembling, broaching, and similar operations requiring fast, accurate production with exceptionally smooth application of pressure. Hannifin gives you everything you want—modern *"JOB-TESTED"* designs . . . precision-built working parts . . . advanced control features . . . every operating convenience! Engineering recommendations on request.

New Bulletin

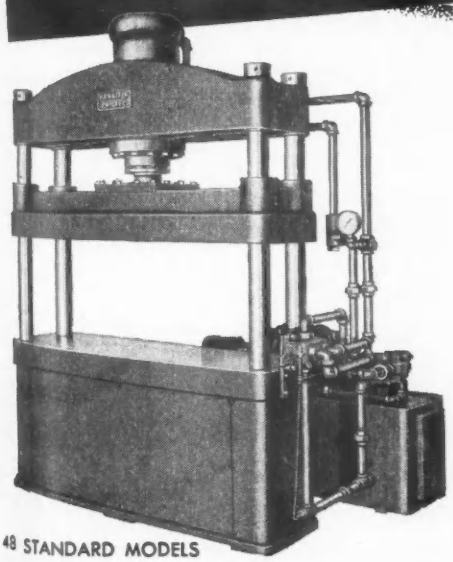


SERIES F
FORCING PRESSES



10 STANDARD MODELS

SERIES C
COLUMN TYPE PRESSES



48 STANDARD MODELS

Lists *75* different standard models

● Get your copy of this new catalog! It contains detailed information on the design and construction of Hannifin's Standardized Hydraulic Presses together with specifications and dimensions for 75 different standard model presses. Ask for Bulletin No. 130-W.

HANNIFIN CORPORATION

1101 S. Kilbourn Ave. HANNIFIN Chicago 24, Illinois

AIR CYLINDERS • HYDRAULIC CYLINDERS • HYDRAULIC PRESSES
PNEUMATIC PRESSES • HYDRAULIC RIVETERS • AIR CONTROL VALVES

Nationwide Sales and Service

SQUEAK STOPPER

To stop squeaks in truck cabs, the American Coach & Body Co. of Cleveland needed an insulating material with *extra toughness* to withstand excessive vibration. It had to make a tight seam. It had to keep out moisture, check corrosion. It had to be easy to apply. And it had to stand up during the long hard life of the truck.

To meet all these requirements, the American Coach & Body Co. picked Du Pont "Fairprene"*P.A.W. tape, a seam sealant made of a fabric coated and impregnated with a synthetic elastic composition. After testing it in continued actual use, here's what they report: "'*Fairprene' P.A.W. tape is the best material we have been able to find for use between metals in the construction of truck cabs.*"

More and more manufacturers are using "Fairprene" P.A.W. tape as a seam sealant, in either the solvent-activated or pressure-sensitive form. And they're using "Fairprene" coated fabrics and sheet stocks for making better new products and improving old products. "Fairprene" is used for gaskets, diaphragms, flexible seals and hundreds of other industrial items. Investigate the possibilities of "Fairprene" materials for your product. Du Pont Technical Service will work with you, can engineer "Fairprene" to meet special needs. Mail the coupon for more information.

Worker applying "Fairprene" P.A.W. tape after wetting its adhesive surface. The wetting agent may be kerosene, naphtha, carbon tetrachloride or lubricating oils. Tape is supplied in desired sizes.

**"FAIRPRENE" is Du Pont's registered trade mark for its line of products made from synthetic elastomers available in the form of coated fabrics, sheet stocks without fabric insert, and adhesives.*

DU PONT "FAIRPRENE"
TRADE MARK
COATED FABRICS • SHEET STOCKS • INDUSTRIAL ADHESIVES
Engineered to do your job better

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

MAIL THIS COUPON TODAY

E. I. du Pont de Nemours & Co. (Inc.),
Fabrics Division A. A. 3
Fairfield, Connecticut

Please send me the latest Technical Bulletins on "Fairprene" Coated Fabrics, Sheet Stocks and Industrial Adhesives.

*Name*_____ *Title*_____

*Firm*_____

*Address*_____

"I *told you so,*"

SAID THE SALESMAN— AND THE CUSTOMER SMILED

Now normally our salesmen are an intelligent, polite group of engineers, but one of our Boston men couldn't resist telling a certain customer, *"I told you so."*

He had been a tough customer . . . wouldn't believe that the Ingersoll-Rand air operated screw driver would out-perform the ones his assembly line was using.

Our man explained how the Cushion Clutch allows accurate torque adjustment . . . how cool and smooth running the I-R air operated screw drivers are . . . how the Engaging Clutch permits continuous running of the "Multi-Vane" motor as the tool is lifted from unit to unit. Finally, the customer smiled tolerantly, said he'd take one . . . on trial.

This tough customer is now a steady customer, because he's found *through use* that I-R air tools reduce his costs and increase his production . . . and make his operators happier.

Oh, yes, after the trial, the customer not only ordered more I-R screw drivers, but smiled as the salesman said, *"I told you so."*

ROCK DRILLS • COMPRESSORS • AIR TOOLS
TURBO BLOWERS • CONDENSERS
CENTRIFUGAL PUMPS • OIL AND GAS ENGINES

Ingersoll-Rand

11 Broadway, New York 4, N. Y. 61-8

ARE YOU STILL AN ACTIVE PARTNER . . .

in this "7½ billion-a-year" success?

NEVER was there a partnership like the nation-wide brotherhood of volunteers who have helped sell, advertise, and promote sales of U. S. Savings Bonds! Their program is the greatest sales operation at the lowest cost in history.

Your continued support in promoting the Payroll Savings Plan will help "America's partnership" this year to repeat or surpass last year's four-star performance, in which sales of Savings Bonds were 7½ billion dollars—*exceeding redemptions by far more than a billion!*

So keep up the splendid work—keep on telling and selling your employees the advantages of Payroll Savings: (1) ease; (2) regularity; (3) safety of investment; (4) security for the individual and the nation; (5) $4 for every $3 at maturity! And, remember, people with a stake in the future are the most stable, most productive employees.

For any help you need in conducting the Plan, call on your State Director of the Treasury Department's Savings Bonds Division.

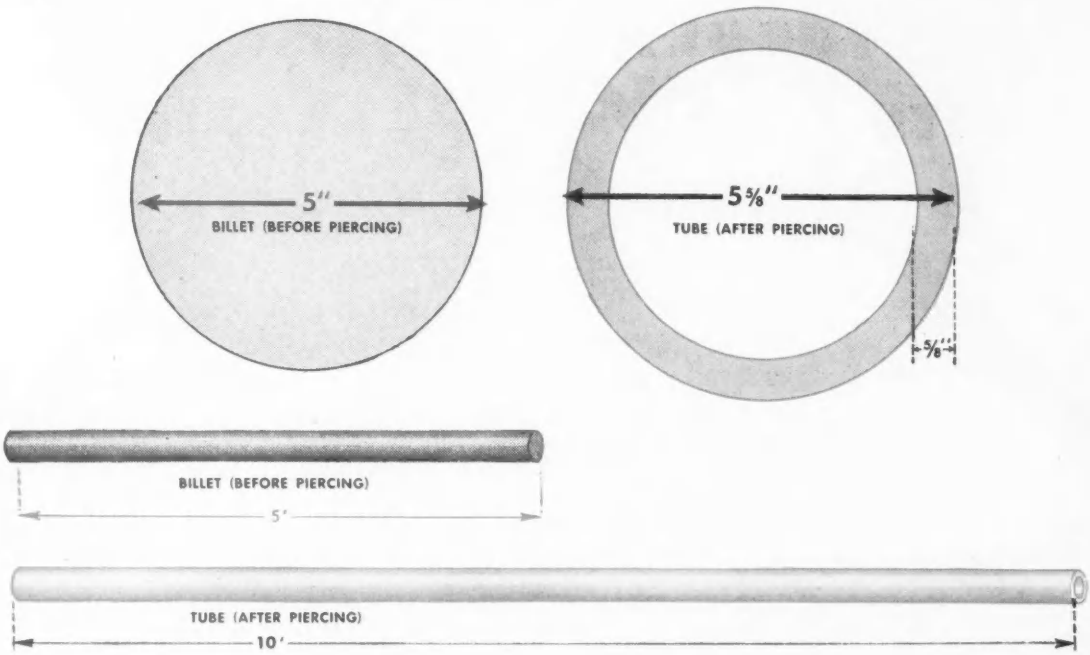
New Savings Bonds Plan won't affect the P.S.P.

THE Treasury Department and the banks of America are making it possible for farmers, doctors, and other self-employed people to participate in "automatic" Bond buying by special arrangement with their banks. This extension of the Savings Bonds program is not a partial payment plan and is intended *only* for people who are not in a position to take advantage of the Payroll Savings Plan.

The Treasury Department acknowledges with appreciation the publication of this message

This is an official U.S. Treasury advertisement prepared under the auspices of the Treasury Department and The Advertising Council.

How to get superior forged quality for your product at lower cost



IF you make a hollow cylindrical part that requires exceptional strength and toughness, Timken seamless tubing can give you the properties you need—and probably save you money too.

The superior forged quality of Timken tubing is a result of the piercing, which is basically a forging operation, in which the metal is worked from the inside as well as the outside. The terrific amount of metal displacement (see above), as the tube is pierced while spinning at 700 r.p.m., results in a refined grain structure and uniform grain flow. At the same time, the steel fibres are given a slight spiral twist, which results in added strength and ductility.

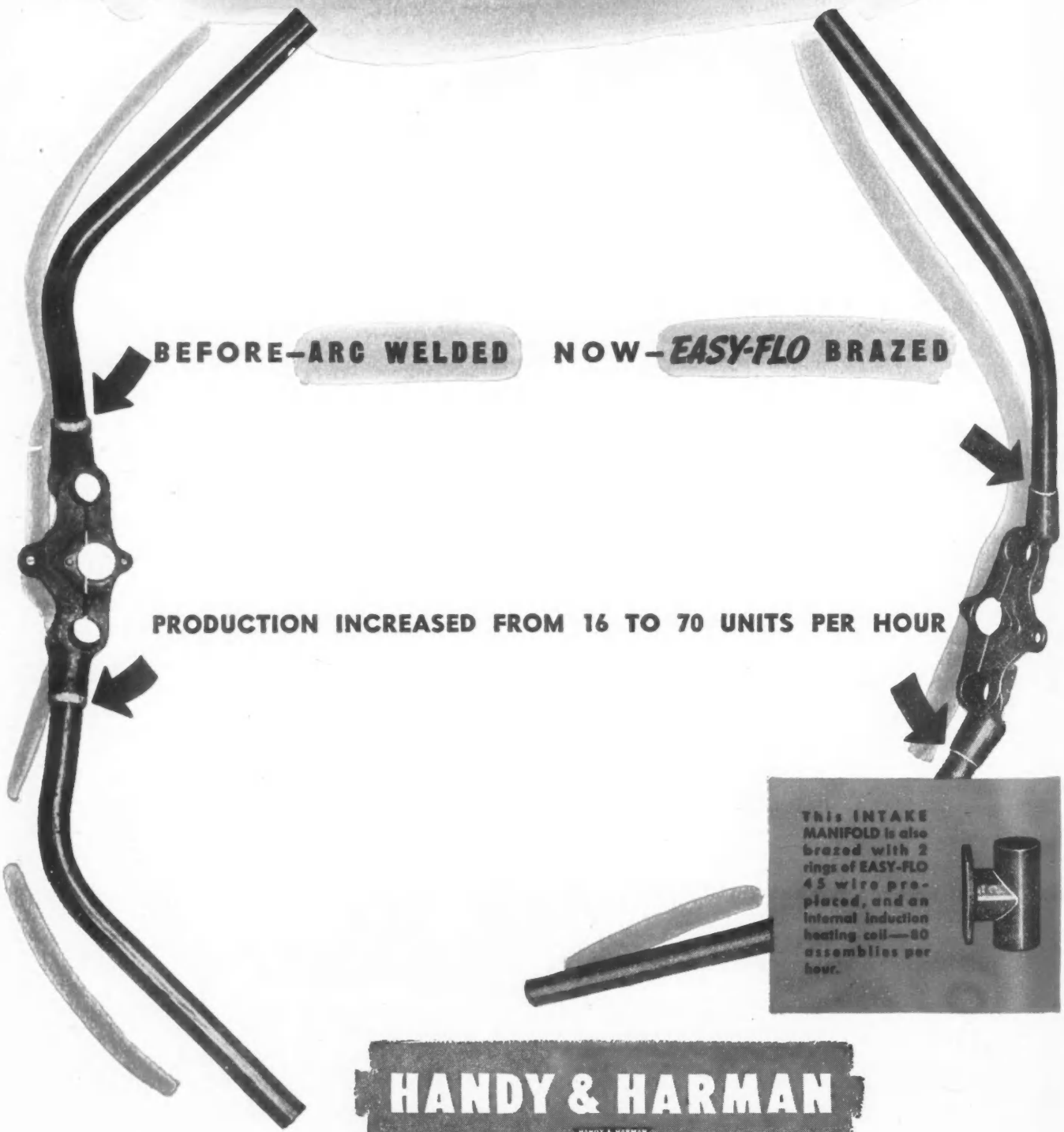
Timken seamless tubing is pierced at the rate of one foot per second. This means that there is no temperature drop during working and that the superior forged quality is uniform throughout each tube. You get uniformity from tube to tube and from heat to heat because Timken controls quality from melt shop through final inspection. Because tubing can be inspected on the inside surface as well as the outside, scrap losses are reduced.

If you make a hollow cylindrical part and would like to increase its strength and decrease its cost why not call upon our Technical Staff for an "on-the-job" analysis. Write Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.

CUT DOWN PRODUCTION COSTS ON TUBULAR ASSEMBLIES WITH *EASY-FLO* BRAZING



BEFORE—ARC WELDED **NOW—*EASY-FLO* BRAZED**

PRODUCTION INCREASED FROM 16 TO 70 UNITS PER HOUR

This INTAKE MANIFOLD is also brazed with 2 rings of EASY-FLO 45 wire pre-placed, and an internal induction heating coil—80 assemblies per hour.

HANDY & HARMAN

82 FULTON STREET NEW YORK 7, N. Y.

Bridgeport, Conn. • Chicago, Ill. • Los Angeles, Cal. • Providence, R. I. • Toronto, Canada

Agents in Principal Cities

You'd never think twins could be so different

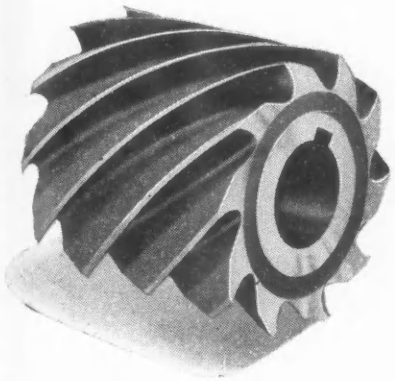
Look closely. Can you tell these milling cutters apart? Both fit the same arbor. Both were designed to do the same milling job. Both cost about the same, *initially*.

Yet, like a set of human twins, tools that *look* alike can be told apart in several ways.

One way is by their "behavior" during comparison tests, when they're run alternately on the same machine, by the same operator, cutting the same stock. You'll know the Pratt & Whitney cutting tool by its *cleaner cutting action* . . . its *longer* life . . . its *trouble-free* performance that reduces spoilage . . . its low cost per piece.

Another, simpler way to recognize the better cutting tool is to look for its "birthmark", the little *P&W* we proudly stamp on every small tool we make — tap, die, reamer, cutter, end mill, counterbore, cut-off tool, thread rolling die, and many others.

No matter how small the tool, its accuracy and durability is always our first consideration. The P&W trademark on a cutting tool guarantees it to be the finest that American craftsmen know how to make. We can prove it by actual performance data.



PRATT & WHITNEY
Division Niles-Bement-Pond Co.
WEST HARTFORD 1, CONNECTICUT

Pratt & Whitney Small Tools

TAPS, DIES, REAMERS, CUTTERS, END MILLS, COUNTERBORES,
CUT-OFF TOOLS, THREAD ROLLING DIES . . .

"There is no better-paying investment than the right tools for the job"

Look out your window... what do you see?

ROLLING past your place of business is the greatest market for automotive horns in history.

More than 35 million cars and trucks on the road today . . . 15 million are 10 years old or older!

Compulsory state inspections in 17 states within the last 6 months reveal that 9 to 11 percent of those tested were operating with inefficient warning signals. *And the law says your horn must sound a warning signal of sufficient volume to comply with safety requirements.*

There's your market for replacement horns! It sizes up like this: 3,850,000 cars and trucks need new or better horns to operate within the law . . . and with safety!

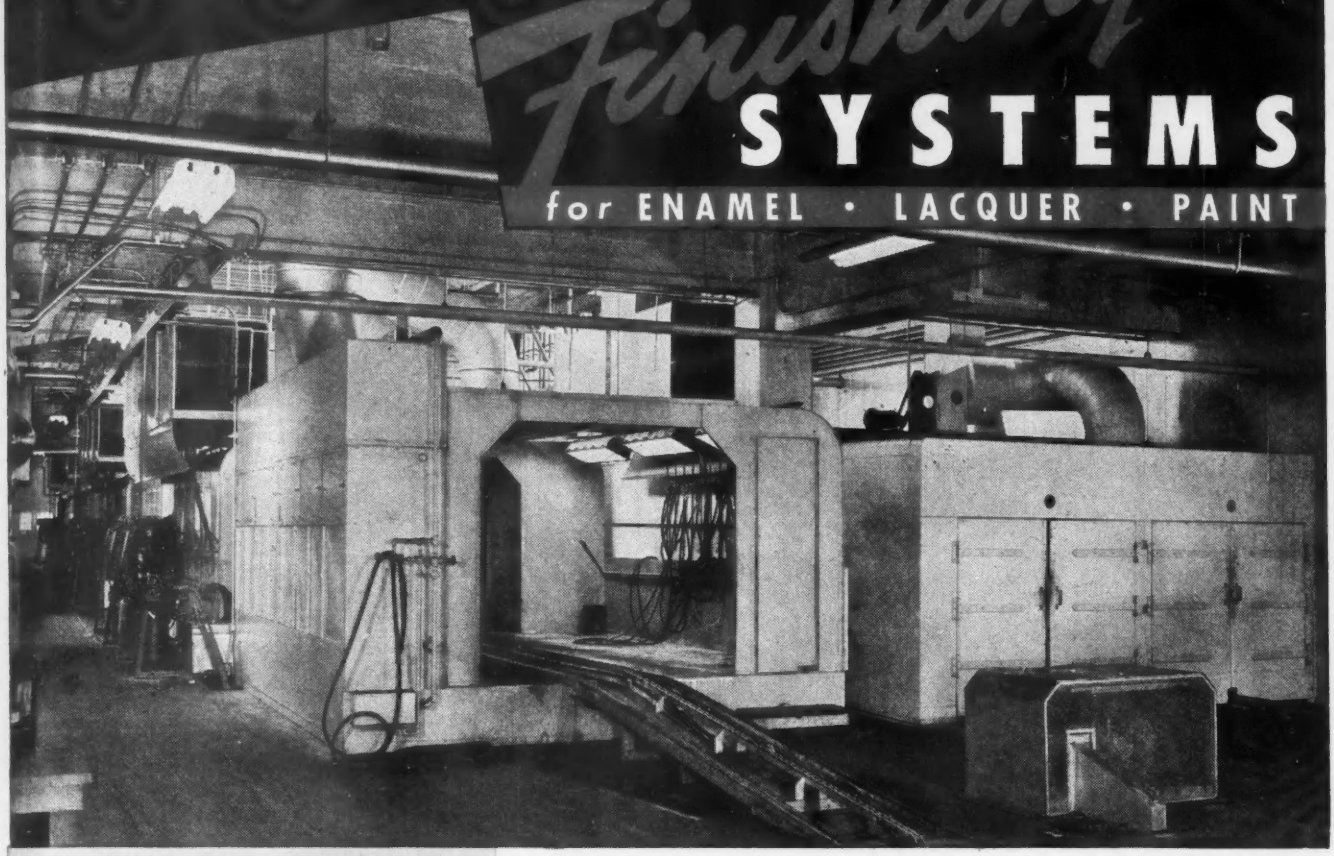
Write for the new Sparton sales manual that will help you get a larger share of this profitable horn business.

THE SPARKS-WITHINGTON COMPANY

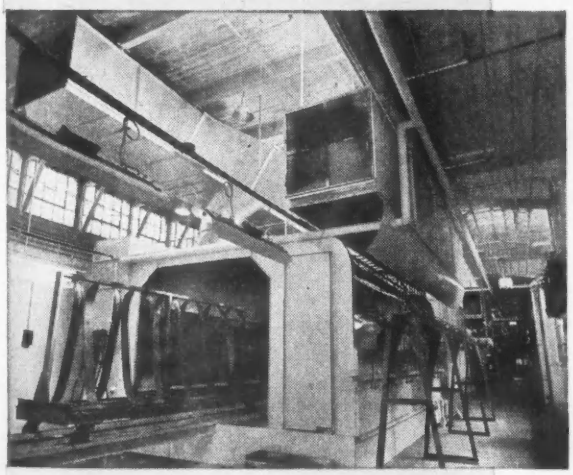
Automotive Division Plant 1 • Jackson, Michigan

COMPLETE *Finishing* SYSTEMS

for ENAMEL • LACQUER • PAINT



Mahon Hydro-Filter Spray Booths, Drying Ovens and Filtered Air Supply Units—Part of a Complete Mahon Finishing System at Studebaker.



Another View of Mahon Hydro-Filter Spray Booths, at Studebaker, Showing Arrangement of Filtered Air Supply to Enclosed Spray Room. This Production Line Handles Bodies and Body Parts of the Studebaker Convertible.

Planned and Engineered to Meet YOUR Specific Requirements!

Every Mahon Finishing System is planned and engineered to meet the individual production requirements of the manufacturer—right from the metal cleaning and rust proofing phase, through to final coat drying or baking. The reputation of Mahon planning engineers is unequalled in this highly specialized field. That is why so many manufacturers all over the world turn to Mahon for equipment to produce the finest finishes . . . they know that twenty-seven years of experience, together with constant research and pioneering development, have endowed Mahon engineers with a wealth of technical knowledge and practical know-how not available elsewhere. See Mahon Insert in Sweet's Mechanical Industries File for complete information, or, if you have finishing problems now, or contemplate new finishing equipment in the near future, arrange a consultation with Mahon engineers today.

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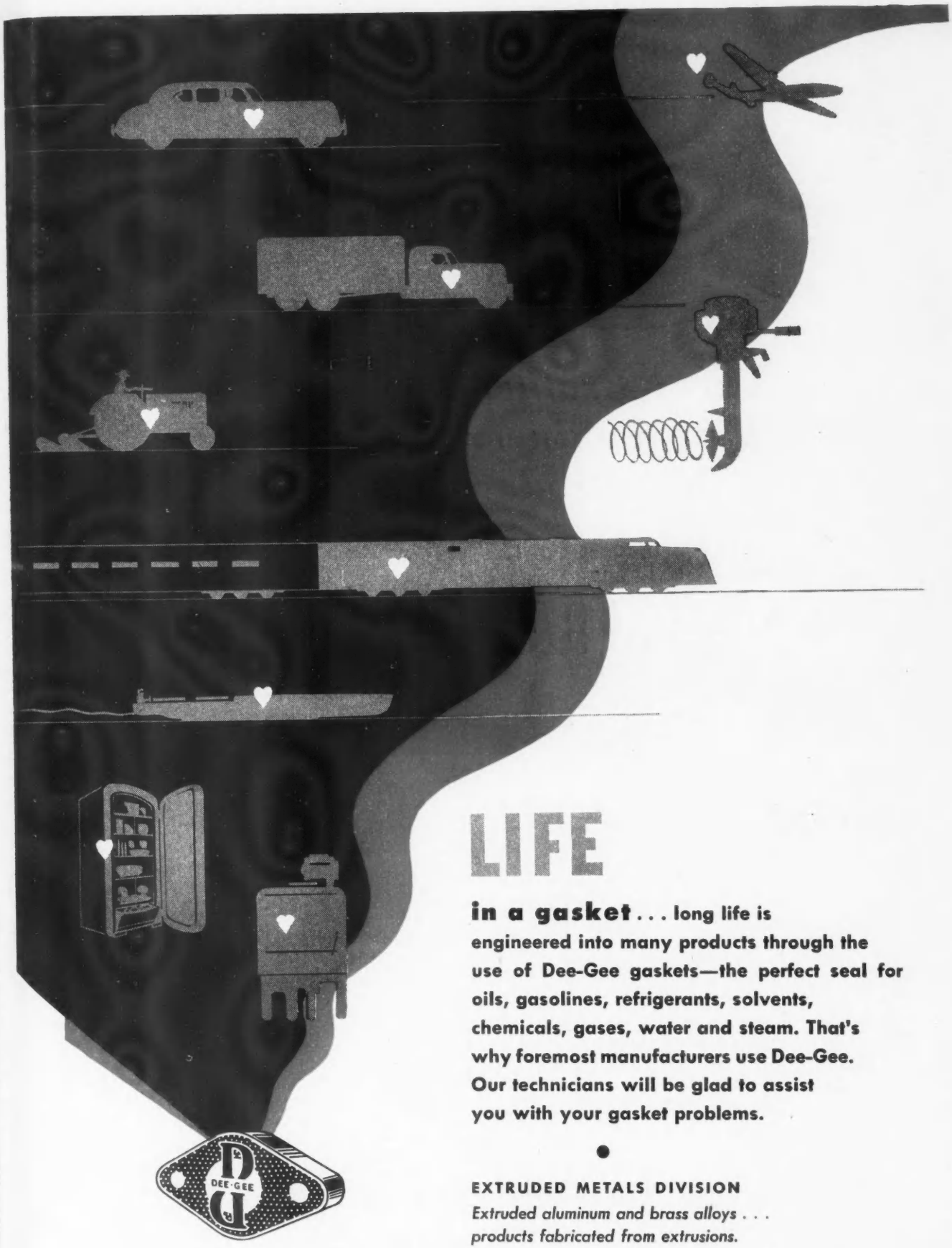

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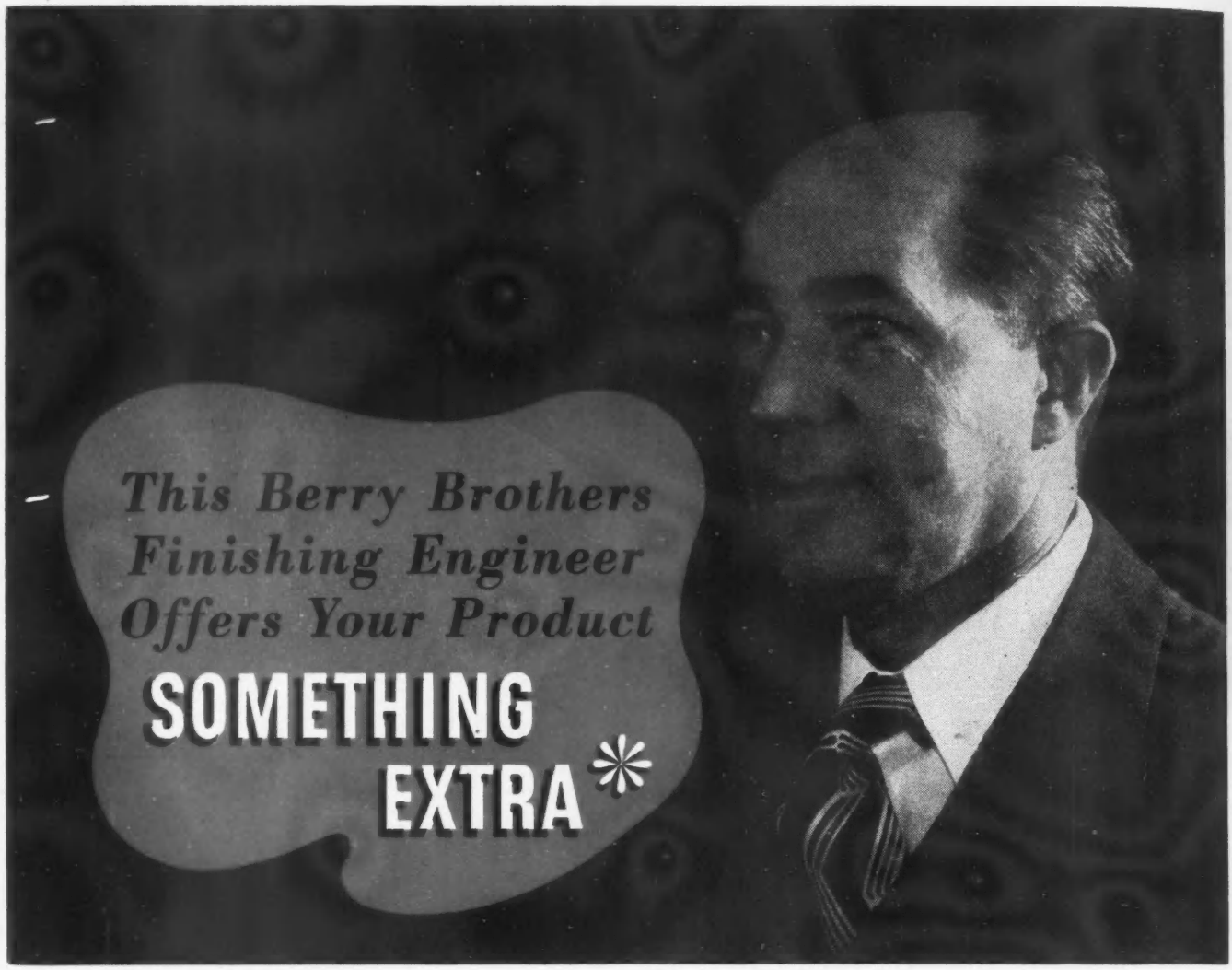

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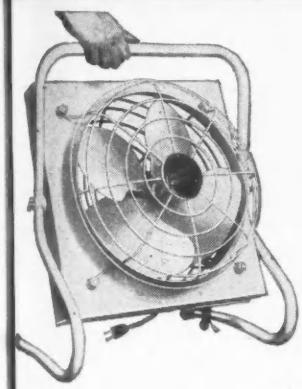

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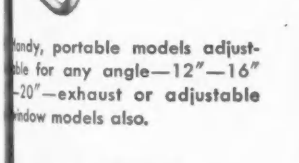

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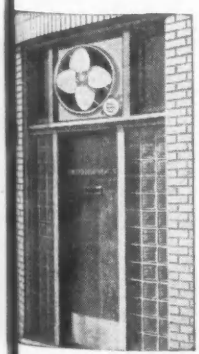
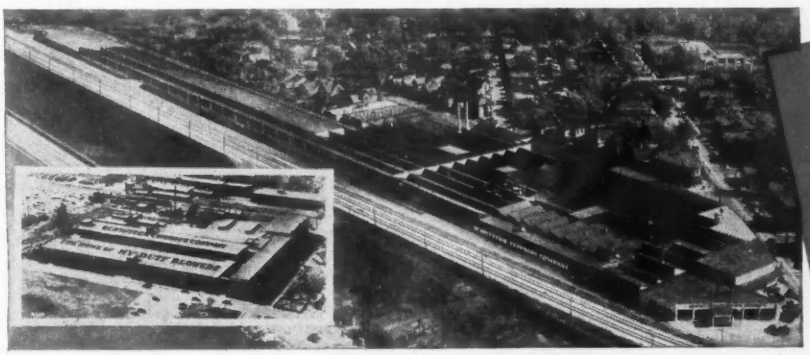


Over main entrance, ventilating reception room.



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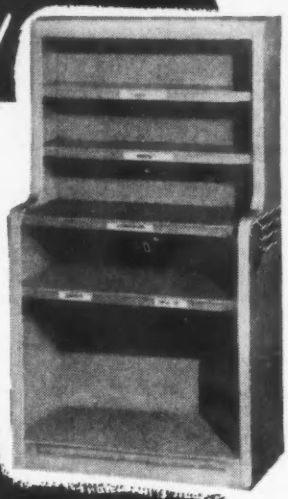

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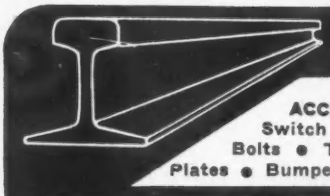

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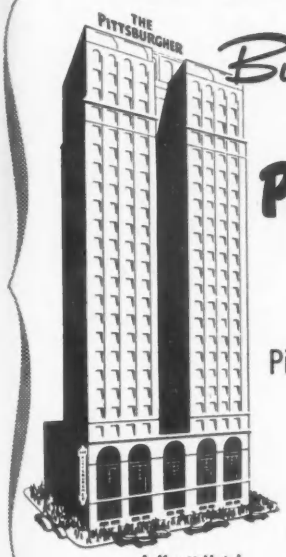

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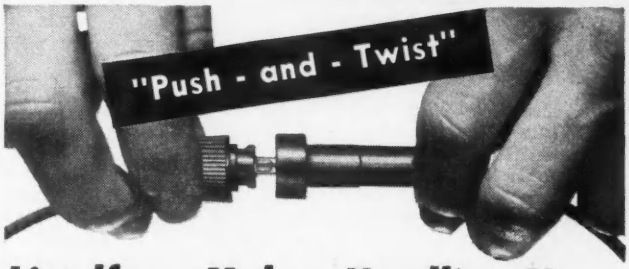

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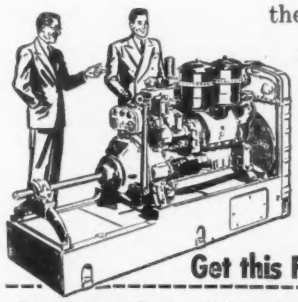

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108 A's ON HIS REPORT CARD

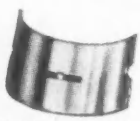
HE HAS TO PASS WITH HONORS
BEFORE HE CAN GO TO WORK FOR YOU

THE flanged copper-lead sleeve bearing shown above was graduated from a rigid "school" conducted by Federal-Mogul's Quality Control group.

In the process of 28 manufacturing operations, this bearing received a series of precise setup and inspection measurement checks—84 in all! Twenty-four additional tests included analyses, temperature controls, special and visual examinations.

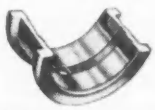
Where "A" meant 100%, this bearing passed 108 times! Otherwise, it never would have left the factory.

The same vigilant care is exercised throughout all six Federal-Mogul plants, in the manufacture of *every* bearing. We are equipped for large or small runs, to your specifications. Consult our engineers on *your* bearing requirements.



HIGH SPEED, high temperature, automotive type bearings available in many combinations.

HEAVY LOAD for big Diesels, power plants, etc.—bearings up to 27½" O.D., steel and bronze back.



SPEED & LOAD bearings for pumps, compressors, industrial electric motors and similar uses.

BRONZE PARTS in many shapes, sizes; thrust washers, bushings; for many types of applications.

Power goes to work smoothly through

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Silent SLEEVE BEARINGS